

Guide for Preparation of Theses and Major Papers

Fall 2010



Minot State
UNIVERSITY

Graduate School

Table of Contents

	<i>Page</i>
Introduction.....	v
Chapter 1: Responsibilities	1
The Graduate Committee	1
The Student	1
The Graduate Student Chairperson	2
The Graduate Committee Members	3
Chapter 2: Procedures	5
Proposal.....	5
IRB Review.....	6
Defense	6
Chapter 3: Components of a Thesis	9
Title Page	10
Copyright Page.....	10
Approval Page.....	11
Abstract	11
Acknowledgements.....	13
Table of Contents	13
List of Tables	14
List of Figures	14
List of Plates	14
Introduction (Chapter 1)	15

Review of Literature (Chapter 2).....	16
Methods (Chapter 3).....	17
Results (Chapter 4).....	18
Discussion (Chapter 5).....	20
References.....	22
Appendices.....	23
Chapter 4: General Thesis Formatting Requirements.....	24
Preliminary Materials.....	24
Margins.....	24
Page Numbers.....	24
Headings.....	27
Typefaces and Spacing.....	28
Footnotes.....	29
Appendices.....	30
Other Conventions.....	31
Tense.....	32
Chapter 5: Citations and References.....	35
Citations.....	35
References.....	36
Chapter 6: Tables.....	39
Parts of Tables.....	40
Format of Tables.....	45
Placement of Tables.....	47

Referencing Tables	49
Chapter 7: Figures and Plates	50
Figures.....	50
Preparation of Figures.....	52
Placement of Figures.....	56
Referencing of Figures.....	56
Plates	57
Chapter 8: Major Papers	58
Preface Materials	58
The Papers.....	59
Appendix A: Example Preliminary Material Pages.....	63
Appendix B: Example Thesis Body Pages	74
Appendix C: Example Appendices Pages.....	86
Appendix D: Examples from Two Papers Option	89
Appendix E: Thesis Review Checklist and Final Submission Cover Sheet	105

List of Tables

<i>Table</i>	<i>Page</i>
1. Parts of a Table	41

List of Figures

<i>Figure</i>	<i>Page</i>
1. Page layout required for theses	26
2. Example of figure caption.....	52
3. Page layout for the major papers option	61
A1. Example Title page	64
A2. Example Copyright page.....	65
A3. Example Approval page.....	66
A4. Example Abstract page	67
A5. Example Acknowledgements page	68
A6. Example Table of Contents page	69
A7. Example List of Tables page.....	71
A8. Example List of Figures page	72
A9. Example List of Plates page.....	73
B1. Example first page of a chapter	75
B2. Example "normal" page from a thesis.....	76
B3. Example "normal" page from a thesis, with a third-level heading	77
B4. Example large table.....	78
B5. Example large table with multi-line title	79
B6. Example two-page table.....	80
B7. Example figure.....	82
B8. Example figure too large to fit caption and figure on same page	83
B9. Example References page	85

C1.	Example Title page for Appendices.....	87
C2.	Example first page of an appendix.....	88
D1.	Example main Title page for two-paper option	90
D2.	Example Approval pages for two-paper option	91
D3.	Example Table of Contents for two-paper option.....	93
D4.	Example List of Tables for two-paper option	96
D5.	Example List of Figures for the two-paper option.....	98
D6.	Example List of Plates for two-paper option	100
D7.	Example first four pages of the body of first paper in two-paper option.....	101

Introduction

This manual has been prepared to help graduate students at Minot State University write their thesis or major paper. The first two chapters discuss student and committee responsibilities and procedures, while the remainder of the manual focuses on style and format of the final writing. This manual is a general guideline using the *APA Manual*, 6th ed. Copies of the *APA Manual*, 6th ed., are available in the MSU Bookstore.

The manual focuses on preparation of theses. Major paper guidelines are similar, but students should consult with their committee chair for specific program requirements. The manual, itself, provides the reader an example of APA manuscript style.

The Graduate School expresses sincere gratitude to Ms. Jolynn Webster for revising the manual. In doing so, Ms. Webster included detailed information for users of APA format based on her work in reviewing Graduate School theses and papers over the past two years. We also extend our thanks to Mr. Nathan Anderson for editing and reviewing the final version.

Chapter 1

Responsibilities

The Graduate Committee

As early as possible in a student's program, he or she should form a graduate committee. This three, four, or five member committee possesses both advisory and judgmental responsibilities regarding the thesis. The student selects the chairperson first. The selection should be based on technical expertise and on personal compatibility. Chairpersons may be changed in the event that the student's research interests changes, or if the chairperson and student find themselves incompatible for any reason.

The composition of the committee varies with each discipline but the majority of the members must hold terminal degrees. No more than one professional graduate faculty member OR one graduate faculty member holding a master's degree may serve on a student's committee. All committees, regardless of size, must include one faculty member outside the student's program. Committee members are typically selected by the student and the committee chairperson and must be approved by the department chairperson and the dean of the Graduate School.

The Student

A student's thesis or project paper is the written record of the research conducted. It should provide evidence of the student's ability to independently perform original research. The student assumes the following responsibilities for the thesis:

1. Consulting frequently with the graduate committee chairperson during all phases of the thesis, including planning and preliminary activities.
2. Meeting with graduate committee members and soliciting input from them.

3. Complying with MSU's Institutional Review Board (IRB) policies and procedures governing research with human subjects. Permission or waivers for the research must be obtained prior to the collection of data.
4. Preparing the document in a scholarly manner as outlined in this manual and the *APA Manual*.
5. Meeting deadlines as printed in the *MSU Graduate Catalog*.
6. Submitting the proposal to graduate committee members at least one week prior to the proposal meeting.
7. Distributing the entire document to graduate committee members at least one week prior to the defense meeting.
8. Obtaining a final review from the Graduate School prior to printing the final document. The Graduate School will only accept papers prepared in APA manuscript (*APA Manual*, 6th ed.).
9. Paying binding fees and mailing costs for the thesis at the MSU Business Office and submitting the receipt and at least five copies of the thesis or major paper to the Graduate School Office within the deadlines given in the *MSU Graduate Catalog*.

The Graduate Committee Chairperson

The graduate committee chairperson and student share responsibility for the quality of the thesis and for ensuring that the thesis is submitted according to APA manuscript guidelines. The chairperson assumes the following responsibilities for the thesis:

1. Guiding the student in the identification of a relevant research topic.
2. Aiding the student in the selection of appropriate design and methodology.

3. Ensuring that proper forms are filed with the Institutional Review Board (IRB). Forms are available from the IRB website which can be accessed from the Graduate School website.
4. Supervising the student in the review of literature, collection of data, and analysis or interpretation of results.
5. Serving as chairperson for proposal and defense meetings. During these meetings, the chairperson should maintain a reasonable flow of questioning and conduct the proceedings in an atmosphere of professional integrity.
6. Filing proposal and defense forms in the Graduate School Office in a timely fashion.
7. Reviewing the student's final paper for thoroughness, grammatical correctness, and APA manuscript accuracy; and signing the Thesis Checklist **before** the student submits the paper to the Graduate School Office for the final review.
8. Grading the thesis at the conclusion of the term. If the student has not successfully completed the document, including the defense, the graduate committee chairperson shall award an "X" (in progress) grade. The chairperson will replace the "X" grade with an appropriate letter grade upon completion of the project.

The Graduate Committee Members

Other faculty members serving on the Graduate Committee are usually selected for their expertise in the particular content area, in research, in design, in data analysis, or in editing.

Responsibilities of the remaining committee members may vary considerably. Overall, the other committee members assume the following responsibilities for the thesis:

1. Aiding the student and the graduate committee chairperson by assisting in their areas of expertise.
2. Meeting with the student as needed and offering advice as appropriate.
3. Preparing for and attending all scheduled proposal and defense meetings.
4. Signing to indicate approval of the proposal presentation and the defense meeting.

Chapter 2

Procedures

Proposal

Prior to conducting research for a thesis or major paper, a graduate student must present his/her proposal to the thesis committee for approval. The proposal is a draft, and typically contains a statement of the problem, a literature review, and a suggested method for examining the problem. During the proposal presentation, the committee meets with the student to discuss the proposed research, make revisions to the plan, and approve or disapprove the research proposal. Most of the discussion will focus on the feasibility of the proposed design. In addition, the student must demonstrate familiarity with relevant literature. Committee members should assure that the problem is of reasonable scope for a graduate thesis. Finally, the committee should discuss ethical implications, the availability of resources, and timelines as they pertain to the study.

When the student and the committee chair agree that the proposal is ready for the full committee to review it, the student is responsible for scheduling the proposal meeting according to the timelines outlines in the Graduate Catalog and for preparing the Proposal Presentation form (available on the Graduate School website) and submitting it to the committee chair. All committee members must approve the student's proposal. Upon completion of the proposal presentation, the committee chair will indicate if the proposal has been approved or not approved, secure committee members signatures, and submit the original form to the Graduate School.

IRB Review

After approval of the thesis proposal, the student must obtain approval from the Institutional Review Board (IRB) for any research involving human subjects. The appropriate IRB review forms are available on the Graduate School website. The IRB has a two week time-frame for review of protocols. Students should submit protocols in a timely fashion. Data collection may not begin prior to approval from the IRB. The MSU Graduate School will not accept any thesis involving human subjects without the appropriate IRB approval and documentation.

Defense

At the conclusion of the research and writing process, the student will schedule a defense in compliance with the Graduate School timelines. The defense is a formal process structured so that the student presents a summary of his or her research. The student also describes major findings, conclusions, and recommendations for further research. Committee members pose questions to the student about the research, focusing on findings, the research process, and conclusions of the study. Editorial issues should be addressed at the conclusion of the defense. The defense is open to the public.

After sufficient discussion of the study, the committee members will evaluate the student's defense in the absence of the student and other audience members. The committee may approve or reject the thesis, and the decision is recorded on the thesis defense form. If a committee member casts a dissenting vote, he or she must sign the appropriate line on the defense form. Only one dissenting vote is allowed for the thesis to pass. The student is notified immediately of the committee's decision.

After passing the defense, the student is required to make the corrections that were requested by the committee. Students are encouraged to use the Thesis/Major Paper Checklist as a guideline when making final corrections. Also, the student and student's committee chair must review and sign the Final Submission Cover Sheet that accompanies the thesis/major paper to the Graduate School for final review.

The Graduate School reviewer may return the thesis to the student to make required changes. The Graduate School review will include only those items including on the Thesis/Major Checklist. Once the Graduate School reviewer has given final approval, the student is ready to print his/her five final copies of the thesis on 8 ½ x 11 size paper that is 25% cotton rag bond and at least 20 pound weight. The final copies must be clean and suitable for microfilming, with uniform darkness and a sharp, consistent imprint. All letters and symbols must be completely legible. The final copies may be the original laser printer copies or photocopies. Dot matrix print is not acceptable. A thesis which does not meet these printing standards will not be accepted by the Graduate School.

The student or his/her committee chair is responsible for securing original signatures on all five copies of the signature form that is bound with the thesis copies. Once these forms are complete, the student must submit five copies of the thesis to the Graduate School Office. In accordance with MSU procedures, the student will pay the appropriate fees for binding the paper prior to submission of the copies to the Graduate School and include the receipt for binding with the five copies. Alternatively, the Graduate School will accept a check accompanying the five copies. Once bound, the original and one copy are placed in the Olson Library, one copy is presented to the committee chair, one copy is placed in the Graduate School Office, and one

copy is sent to the student. Students may pay extra fees to have more copies bound for personal use.

Chapter 3

Components of Theses

The components of a thesis are:

Title page

Copyright page (or blank page)

Approval page

Abstract

Acknowledgments

Table of Contents

List of Tables

List of Figures

Introduction (Chapter 1)

Review of Literature (Chapter 2)

Methods (Chapter 3)

Results (Chapter 4)

Discussion (Chapter 5)

References Cited

Appendices

The same basic components comprise major papers that are submitted for the “two papers” option, although the organization is somewhat different. The specific nature of some of the components of a thesis or major paper will vary with the type of study, but the basic purposes of these components are fairly standard. The following sections briefly describe these components.

Title Page

Title. The title serves two purposes. The first is to attract the potential audience. The second is to aid in indexing and retrieval. The title should be as informative as possible, and as short as possible. Include several keywords, starting with a word or term that represents the most important aspect of the thesis. Subsequent terms should be in order of decreasing importance if possible. The APA Manual recommends a length of 10 to 12 words. For more specific instruction on forming a title, refer to the *APA Manual*, 6th ed.

Other information. Immediately following the title is a statement regarding the degree for which the thesis has been submitted. The remainder of the title page consists of the byline information, which includes the name of the author and department/college/university affiliations. The last information presented is the term and year of completion. The format of the title page is prescribed, and should be followed closely (Appendix A, Figure A1).

Copyright Page

Under the Copyright Act of 1976, an unpublished work is copyrighted as soon as it is written on paper. Copyright protection is “an incident of the process of authorship” (U.S. Copyright Office, 1981, p. 3). An author owns the copyright on an unpublished manuscript until it is formally transferred. Inclusion of a copyright page in the thesis (Appendix A, Figure A2) is optional. The thesis, even in final bound form, is an unpublished work; inclusion of a copyright page is not necessary in order to retain the copyright protection afforded authors of unpublished works. Legal action in a case of suspected infringement requires registration of the copyright. Inclusion of a copyright page in a thesis does not constitute such registration. There is a formal procedure for registering a copyright. Nonetheless, inclusion of a copyright page in the thesis

does convey to anyone obtaining a copy of the thesis that the author intends to retain or enforce her/his copyright protection and may help to prevent infringement.

Approval Page

The Signature Approval Page presents the name of the student submitting the thesis, the signatures of the student's graduate committee members, the signature of the dean of the Graduate School, and the date of the thesis defense. Students should follow the format shown in Appendix A (Figure A3) for the approval page. This page requires original signatures on all copies.

Abstract

The purpose of the abstract is to provide a concise summary of the important parts of a thesis, in particular the new knowledge it contains. Some argue that the abstract is the most important part of a thesis. Many more people read the abstract than read the entire thesis. The abstract helps readers to decide whether or not to read the thesis by allowing them to determine its nature and scope. It is also the form of the new work that is most widely disseminated. The abstract should be a self-contained abridgment of the innovative parts of a paper without interpretation or comment.

The type of abstract most commonly used is the informative abstract, providing specific summaries of certain elements of the thesis. The content and organization of the abstract should follow the text accurately and objectively, generally focusing on the methods, findings, and conclusions. Thus, it is different than a summary. A summary is an abridgment of the entire paper, providing a shortened version of the paper. Each section of the paper is reduced

proportionately. An informative abstract is a nonlinear reduction of the paper. Only certain parts are summarized, and these parts may not be reduced proportionately.

Abstracts should generally be a single paragraph with no subheadings. Recommendations on length range from 80 to 250 words. The abstract is technically not part of the thesis, but rather a separate self-contained body of text that can be (often will be) abstracted and/or disseminated separate from the body of the thesis. Because it must be self-contained, the abstract should not contain reference citations, or references to figures, tables, or sections of the thesis. While the *APA Manual* suggests reference citations are permitted in abstracts, this is contrary to the requirement that it be self-contained because the full reference information for any citations would not be included in the abstract. In general, writers should avoid equations or other things that must appear on a separate line from the text of the abstract.

Because the abstract summarizes certain parts of the paper, it should be written last. Deciding what to include is not an easy task, but the focus must be on the research objective, methods, results, and conclusions. Many things from the paper are excluded from the abstract, but everything that is included must come from the paper. Nothing should appear in the abstract that does not appear in the paper. Writing and editing the abstract involves balancing information and words, to maximize information and minimize words. The abstract is not like other paragraphs; it is presented as a paragraph to save space, but it is not intended to be a coherent paragraph. Writers should avoid transitions and connecting phrases. They should also avoid duplication, such as a general statement that is followed by a specific statement that presents the same information. An example abstract is shown in Appendix A (Figure A4).

Acknowledgments

Writers must be sure to acknowledge assistance they have received. This section has two purposes. The first is to express appreciation publicly to persons, groups, or institutions that provided assistance in the performance of the research. The second is to make clear the contributions others made to the research. If the research was supported through a grant, acknowledgment of the support is usually required. The acknowledgments should include the agency or organization that provided the grant and the serial number of the grant. Some types of support are usually not acknowledged in papers, but are acknowledged in theses. Typically, the work of assistants is not acknowledged unless they made significant contributions. Personal support (i.e., family, friends, etc.) is typically not acknowledged in a paper. However, in a thesis, assistants and personal support usually are acknowledged. An example Acknowledgments page is shown in Appendix A (Figure A5).

Table of Contents

The Table of Contents begins with listing of the Abstract; the Title Page and Approval Page are not included. The style of the text should match the level of the heading. For the preliminary parts (Abstract, Acknowledgements, List of Tables, and List of Figures), treat their names as level-1 headings. The same applies to the References and Appendices. Note that the Table of Contents is not listed in the Table of Contents.

For the chapters of the thesis, you are not required to list all levels of headings in the Table of Contents. You should list the levels that will easily guide readers to the various parts of the thesis. Generally, you should list at least through level-2 or level-3 headings. Whatever levels are chosen for inclusion in the Table of Contents, those same levels should be shown for

each chapter (when they exist). An example Table of Contents is shown in Appendix A (Figure A6). Note the heading of the Table of Contents page: Table of Contents is bold and centered; Page is italicized and aligned with the right margin.

List of Tables

The List of Tables should list all tables, including those that appear in appendices. The title of each table in the list should match exactly the title on the table. If a table title is longer than can fit on one line, the page number should be shown to the right on the last line of the title. An example List of Tables is shown in Appendix A (Figure A7). The heading of the List of Tables page is List of Tables in bold, centered; Tables in italics and aligned with the left margin; Page in italics and aligned with the right margin.

List of Figures

The List of Figures should list all figures, including those that appear in appendices. Because figures have captions (some of which may be lengthy) rather than titles, it is typically not feasible to reproduce the entire caption for each figure. For purposes of the List of Figures, you will need to write a description (“title”) that sufficiently and concisely conveys the nature and contents of each figure. These titles should be written using sentence-style capitalization, but they do not need to be written as complete sentences. If a figure title is longer than can fit on one line, the page number should be shown to the right on the last line of the title. An example List of Figures is shown in Appendix A (Figure A8). Use the same format for the List of Figures page heading as used for the List of Tables.

List of Plates

If the thesis contains one or more plates, a List of Plates should follow the List of Figures. As with the List of Figures, the List of Plates should list all plates, including those that

are referenced in appendices. Because plates are really figures that do not fit within the space available on standard pages, development of the List of Plates is handled in the same fashion as development of the List of Figures; a title must be written for each one. An example List of Plates is shown in Appendix A (Figure A9).

Introduction (Chapter 1)

The introduction is the beginning of the paper proper. In a thesis, it is the first chapter. The introduction should establish the framework for the research so that the reader can understand how it relates to other research. It should include answers to basic questions, such as who, where, when, how, and why? The writer should proceed from the more general to the more specific. A general research problem is identified, and then within this problem a specific research question (or set of questions) is presented. A background for these is presented from the literature (to a limited extent compared to the next chapter). Answering the research question constitutes the objective of the research.

Research Problem: Extract from the general background of knowledge on the subject the problem of interest, that is, the uncertainty, confusion, or controversy that exists.

Research Question and Objective: The research question is the specific aspect or aspects of the research problem being addressed. The objective is to answer the research question. The *objective* is often referred to as the *purpose*, although purpose can be more general. Purpose can refer to *the what* of the research, the specific question addressed (objective may be a better term for this). Purpose can also refer to *the why* of the research, the reason or justification for the research.

Background: The background or literature cited in the introduction is not a complete or systematic review of literature related to the general research problem and the specific research question. Rather, it should focus on the most important background information needed to present the research problem and question. A more thorough background (both in breadth and depth), when needed, is the purpose of the next chapter.

The challenge in developing the introduction is to frame the research question in the most logical and economical manner possible. Because many write the introduction first, there is a tendency to write expansively (too much breadth) and at length, producing an introduction that is diffuse and overextended. If a broad background must be presented, it should be given in a background section that follows the introduction. Some argue that it is best to write the introduction after some of the more “concrete” parts of the thesis are written. This makes some sense given that the goal of the introduction is to lay the foundation for what follows. If the introduction is written first, it must be edited carefully after the rest of the thesis is written.

The difficult part of writing the introduction is developing a logical structure. One logical sequence is to start with some background to define the problem. From this the research question and objective emerge. Some will start the introduction with the research problem (then give some background), or even with the question and objective. Some may end the introduction with a brief summary of the results and conclusions. Others see this as superfluous given that such a summary is part of the abstract and is given in detail later in the paper.

Review of Literature (Chapter 2)

The Review of Literature chapter provides a systematic and thorough review of relevant background information from the literature. Thus, this chapter will include numerous reference

citations. APA manuscript form employs the in-text citation method, discussed later in this Manual. Much of the background will directly relate to the research problem and question, as presented in the Introduction; here it is presented with greater breadth and depth. Also, this chapter may include relevant background material that is even more general. Defining your audience is central in deciding what general background information to include.

In structuring this section, writers should start with the more general background and move to the more specific. Starting with the general material will familiarize a generally literate audience with the important concepts, processes, and terms that are part of the specific field. Thus the reader will get more out of the more specific background that follows.

Methods (Chapter 3)

The Methods chapter of a thesis is fairly straightforward, clearly describing the methods used in the research. Here again, the audience determines the level of explanation needed. In any case, the reader should be able to use this section to duplicate the study. Below are brief descriptions of typical components of the Methods chapter; these are not necessarily required subheadings.

Research Design: For a complex study, the Methods chapter may begin with a description of the research design so that the reader can understand the relation of the separate procedures to the various sections of the methods, and to the research overall. In very complex studies, this may be detailed enough that a separate subheading is justified. In other cases, describing the research design may consist of an introductory paragraph that outlines what follows in the chapter.

Materials: In experimental studies in particular, it is important to describe the materials used. The exact state, purity, etc. of the materials may be very important. Readers that are knowledgeable in the field should not be left wondering whether the proper materials were used.

Description of Procedures: This section should describe the operations or measurements performed before and during a study. Preliminary or preparatory procedures that lead up to the main experiment or sample collection should be described. The central or experimental procedures are those that address the research question(s). Procedures range from very simple collection and testing techniques to highly specialized and complex procedures. There may be cases where a procedure is standardized such that it is not necessary to fully describe it (consider the audience). Even if it is standard, the author must decide whether the audience going to be familiar with it. Error should be on the side of describing too much rather than too little.

Analysis of Data: Describe any statistical or computational methods used in manipulating or analyzing the data. These are an important part of the methods. Standard methods (e.g., linear regression, Student's t-test, etc.) do not need to be described in detail, but of course their use should be mentioned, and justified if appropriate.

Results (Chapter 4)

The Results chapter of a thesis presents the new findings, the observations and measurements made during the procedures described in the methods section. In experimental papers, where the results are largely quantitative observations or measurements, the results may be rather short compared to the methods and the discussion. Such results are typically numerical in form, and may be converted to values of interest by various mathematical means. Numerical results are usually most effectively presented in the form of tables or graphs. In more descriptive

studies where the results are largely not quantifiable, they are presented verbally and the results section may be much longer. Efforts are often made to attain an objective, quantitative-like form, with the words taking on a quasi-quantitative role.

In any case, accuracy is a primary goal in writing this part of the paper. The results section is the primary and permanent record of the new knowledge. The importance of accuracy is why results must be presented separately from the methods and discussion, the latter containing interpretations. The objective in reporting results is to include all of the findings in full, and to present them in a systematic order. The results must deal with the research question being addressed and the hypotheses being tested. Both positive and negative results (in terms of the results anticipated or predicted by the hypothesis or hypotheses being tested) must be objectively presented. Results that do not pertain directly to the research question should be omitted.

Much of the results section may be presented in tables or graphs, but this section should not be merely a collection of tables and figures connected by a thin thread of text. The function of tables and figures is to illustrate the written text, not substitute for its substance. The tables and figures must be adequately integrated into the text, which involves more than simply announcing their presence. Writers should avoid wasted sentences that simply refer to a table or figure. Rather, they should refer to the table or figure parenthetically in a sentence that contributes to the development of the section.

In terms of structure, it is logical to organize the results in parallel with the methods described in the previous chapter. It is essential that only results are included. Do not start with background discussion. Do not include description of methods, or restate methods. Most

importantly, do not include interpretations. Sentences should be declarative, factual, informative statements, not statements of explanation, interpretation, commentary, inference, and so on (i.e., discussion). Discussion may distort the results, and may make it seem as though interpretations are being treated as factual information.

Discussion (Chapter 5)

The Discussion is the final chapter of a thesis. It is where the results are interpreted or explained, to give meaning to the results and the research as a whole. The objective is to examine the results, address whether they answer the research question, compare them within themselves and to other studies, explain and interpret them, and draw conclusions or present generalizations. The discussion section may also make recommendations for applying the new results, or for future research. The open-ended nature of the discussion gives the writer the freedom to speculate about the results of the research while placing it into the framework of past research. Thus, the interpretation of the results may involve synthesis across three different frameworks: (1) that of the immediate research, (2) that of related research, and (3) that of research and theory in the discipline. The importance of each of these frameworks varies with the nature of the study. They should be addressed as the research requires.

It is logical to begin the discussion with the immediate research results. This is a discussion of similarities, differences, and trends among the observations or data in light of the research question. The first level of conclusions is drawn from this discussion. These conclusions are known as the direct or immediate conclusions. They are then examined further, in themselves and in reference to the literature.

The results should be discussed in relation to other research. Emphasis may be placed on results that are new or important additions to the discipline, with an explanation of how the results add to the knowledge in the discipline. Thus, the research is integrated with other studies, to make it part of the larger framework of the discipline. Conclusions drawn here are called intermediate or indirect conclusions. The immediate or direct conclusions may have to be modified so that the intermediate conclusions are logically consistent with the relevant literature. Further, broader review of the literature is part of presenting final or ultimate conclusions. Here, all available evidence is considered. This broader discussion is often theoretical, perhaps speculative. Such discussion must be clearly set apart so that it does not become a broad discussion built upon the narrow base of the immediate research.

In some cases, negative or discrepant results must be considered. The results may not answer the research question or support the hypothesis, or they may not be consistent with previous studies or established principles or theoretical concepts. In these cases, the writer must try to account for the differences.

Conclusions. The conclusions in a paper are the inferences and deductions presented in the discussion. When the conclusions (primarily intermediate conclusions) are interspersed throughout a long and complex discussion, it may be helpful to restate (summarize) them in a separate section titled “Conclusions”. When it is used, this section should be short. Its purpose is to summarize and emphasize the conclusions, not to discuss them further. Including further discussion of the conclusions, or even summarizing more than the conclusions are common mistakes.

Recommended applications. If the thesis research leads to some specific applications of the results, a separate section titled Recommended Applications may be useful. Although the recommended applications may have already been discussed earlier in the chapter, a separate short section may help to summarize and emphasize the recommendations.

Recommendations for further research. In some cases, the research questions being addressed may not have been completely answered by the research that was conducted. Even when the research questions have been adequately addressed, the research often leads to some new questions. In either case (or both cases), the study may lead to some recommendations for additional research. These can be described in a separate section titled Recommendations for Further Research.

Use of a summary section. The purpose of the Discussion chapter is to examine and interpret the results. Doing so requires reference to the results, and perhaps the methods. However, the discussion should not include any type of systematic repetition of methods or results. Although some references suggest a summary can be part of the Discussion chapter, it really serves no purpose. The Discussion chapter should not begin with a summary of the background, methods, and results presented in the previous chapters, nor should it end with a summary of the entire thesis. The abstract is intended to provide a summary of the important aspects of the thesis; there is no need for a Summary section within the Discussion chapter.

References

This section presents full reference information for the citations made in the paper. It should include only references that were cited in the paper (it is not a bibliography). It must present all references cited, including those that may only be cited in figures or tables. Basic

information on citations and references is given in Chapter 5 of this Manual; students are encouraged to rely on the *APA Manual*, 6th ed., Chapter 7, for specific examples and rules.

Appendices

An appendix is a body of material that is set apart from the main text of the paper. Appendices are used to present information that is too detailed (and distracting) for inclusion elsewhere in the paper, where it would interrupt the flow or line of development. They may be used to present supplementary illustrative details, supporting data (such as procedures, mathematical symbols or derivations), and any detailed development or explanation. Although editors generally discourage use of appendices in journal articles, they are commonly used in theses and dissertations.

An appendix should not be used as a collection of assorted information. An appendix should be limited to a single subject. Thus, in some cases multiple appendices will be needed. Each appendix should be labeled (e.g., Appendix A, Appendix B, etc.), unless there is only one, and each should be titled. In cases where the title does not adequately relate the nature of the appendix, brief introductory text should be presented. Numbering of tables and figures in appendices is explained elsewhere in this manual (see Chapters 6 and 7).

Chapter 4

General Thesis Format Requirements

Some specific format requirements were presented in previous chapters. This chapter describes the general format requirements for theses. The page layout required for theses is summarized in Figure 4.1. One possible addition to this layout is necessary when the thesis includes one or more plates. In this case, there should be a “List of Plates” page that follows the “List of Figures” page.

Preliminary Material

The formats used for preliminary material (Title Page through List of Figures, or List of Plates) are illustrated in the example pages provided in Appendix A. Students should follow these examples carefully in preparing these preliminary pages.

Margins

The margins on all four sides of every page must be a **minimum of 1 inch** and **no more than 1.5 inches**. (This manual employs a 1 inch margin on all four sides). Only page numbers (placed in a header) are placed outside of the margins. The required margins apply to tables and figures as well as the text, and they apply to all pages, including preliminary material and appendices. The only items to which the required margins do not apply are plates, because these are not bound with the thesis.

Page Numbers

All pages of the thesis are counted with the exception of the blank or copyright page that follows the Title Page. All preliminary pages (all pages prior to the first page of Chapter 1) should be numbered with lower case Roman numerals. The only exception is the Title Page, which is assigned a page number (i.e., counted as page i), but it is not paginated (no page number

is shown). Beginning with Chapter 1, and continuing through the References and any appendices, all pages are counted and paginated (with some exceptions) with Arabic numerals. The only pages that are not paginated are the first page of each chapter, and the page (if present) labeled “Appendices” or “Appendix”.

Page numbers, whether Roman or Arabic numerals, are placed at the upper-right corner of the page. They should be located inside of the right-hand margin. If margins are set for 1 inch, set the header for the page number at .7; if margins are set for 1.5 inches, set the header for the page number a 1. To set the page number in Microsoft Word, use Insert/Page Number/Top of Page--Plain Number 3. The page number can then be formatted as needed (to be either lower-case Roman numerals or Arabic numerals).

Changing the type of page number (Roman numerals to Arabic numerals) or omitting the page number from a page requires use of a section break within word processing programs. The places that require a section break are before (transitioning to) the first page of each chapter and before the page (if included) labeled “Appendices” or “Appendix.” The section break should be inserted after typing on the preceding page is completed. In Microsoft Word, select... Page Layout/ Break /Section break – next page. The cursor will move to the top of the next page, and the section number increases by one. The section break allows the pages of different sections, including headers and footers, to be formatted differently.

To set the type of page number to be used: Double-click in the header area, to activate the headers and footers. In the Header and Footer section of the Formatting Palette, select... Format page number. In the window that appears, you can choose the format of the page numbers. Within the preliminary materials section, select the i, ii, iii... format. In the

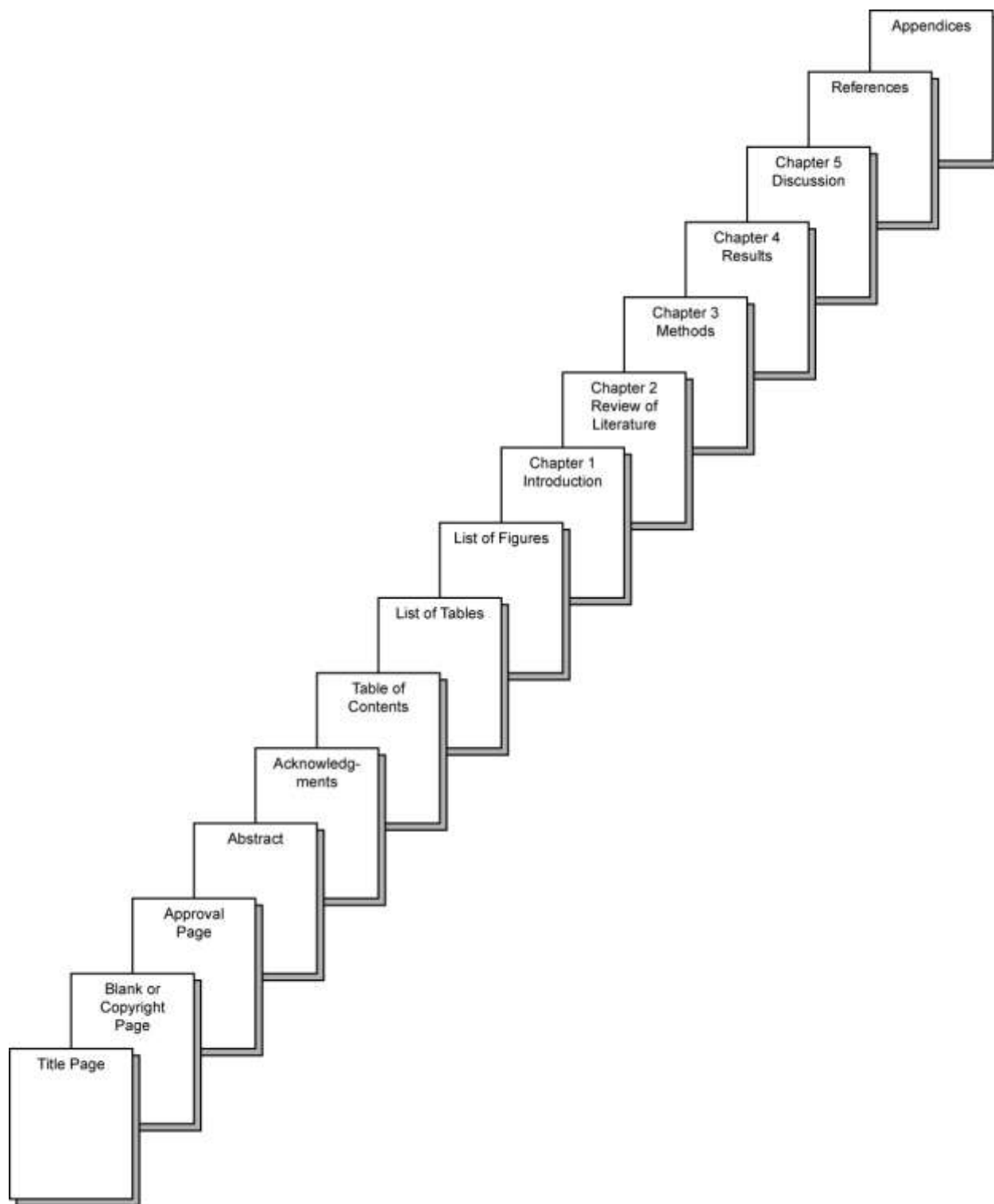


Figure 1 Page layout required for theses.

Chapter 1 section, do the same thing but select the 1, 2, 3... format. In this section, the starting page number should be set to 1, not continued from the previous section.

To omit a page number from the first page of the section: In the Header and Footer section of the Formatting Palette, select... the checkbox next to Different First Page. Any items in the header and footer will then be omitted from the first page of that section.

Headings

The APA Manual defines five possible levels of headings. However, in most theses, all five levels will not be needed. Headings help readers navigate the thesis; but using too many levels can be more intrusive than helpful. The five levels of headings set forth in the APA Manual are formatted as follows:

- Level 1 centered, boldface, uppercase and lowercase (capitalized) heading
- Level 2 flush left, boldface, uppercase and lowercase (capitalized) heading
- Level 3 indented, boldface, lowercase (only first word capitalized) paragraph heading, ends with a period
- Level 4 indented, boldface, italicized, lowercase (only first word capitalized) paragraph heading, ends with a period
- Level 5 indented, italicized, lowercase (only first word capitalized) paragraph heading, ends with a period

These heading formats outlined in the APA Manual 6th edition differ from those outlined in the 5th edition.

In theses, the highest level heading is used to title the chapter. Both the chapter number (e.g., Chapter 1) and the title of the chapter (e.g., Introduction) are considered to be part of the same heading, even though they are typed on separate lines, double-spaced.

Typeface and Spacing

The Graduate School accepts font types include Times New Roman, Arial, and Courier. Acceptable font sizes are 10 pt and 12 pt. For Times New Roman and Arial, 12 pt text works best; 10-pt text is rather small, and more difficult to read. For Courier, 10 pt works best; 12-pt text is rather large. The preferred typeface is a 12-pt Roman (serif) typeface such as Times New Roman. The same typeface must be used throughout the thesis, with the exceptions of lettering that is part of the body of a figure and material in appendices, for which a different typeface may be used. One additional exception to the font size requirement relates to table notes, which may be a smaller font (e.g., 10-pt Times New Roman).

Text should be written using left justification (i.e., text aligned with left margin, except when indented). Full justification, which spreads the text to align with both the left and right margins, should not be used.

The Graduate School prefers spacing simply be double-spaced throughout the document. However, appropriate use of larger line spacing (triple or quadruple) in some places can improve the readability of the thesis. Triple line spacing (two blank lines) is required above and/or below tables that appear on a page with normal text, to more clearly offset them from the text. As shown on an example page (Appendix B, Figure B1), quadruple line spacing (three blank lines, or one blank double-spaced line) may be use following chapter headings, to make these major

headings more distinguishable. A larger line spacing (triple spacing should suffice) may also precede headings, particularly higher-level headings. Consistency in spacing is the key.

Footnotes

Footnotes are specific notes to the main text that are placed at the bottom of the page. They are similar to specific notes used in tables except that they are noted with a superscript number rather than a letter. In word processing programs, such as Microsoft Word, place the cursor where the footnote is to be placed; select Insert/Footnote from the menu. The footnote number should be placed following any punctuation, not preceding it (e.g., note goes here,¹ etc...); one exception is in the case of a dash (e.g., text – note¹ – text etc...). The correct superscript number will be placed at that point, and the cursor will move to the bottom of the page where the corresponding number appears. The footnote can then be typed at that point. Microsoft Word will automatically sequence footnotes that are inserted, such that a sequential numbering is used throughout the document. The program will also insert a partial, left-justified horizontal rule above the footnote, and insert some “extra” spacing between the horizontal rule and the bottom of the main text on that page (to help offset the footnote from main text). Multi-line footnotes should be double-spaced.

There are two types of footnotes to main text. The first type is a content footnote. These are used to supplement or explain information in the text. They are useful when the explanation would disrupt the flow of the narrative, creating a distraction. However, the footnote must not itself be so complicated that it becomes a distraction once the reader does go to it. Footnotes should convey one basic idea. If it becomes too long, then that material is probably better placed within the main text or in an appendix. The second type of footnote is a copyright permission

footnote. Copyrighted publications vary in terms of the length of quoted material that may be used without written permission. When needed, copyright permission footnotes are used to acknowledge the source of a quotation, and convey the fact that permission for its use was obtained. Except for the use of the subscript number designation, the form of these footnotes is the same as used for a copyright note for a table.

Appendices

Appended material is placed after the References section, starting with a page labeled “Appendix” or “Appendices” depending on whether there is one appendix or more than one. The label should be centered on the page (vertically and horizontally), and this page is counted in the page numbering but should not be paginated (see Appendix C, Figure C1). If there is only one appendix, the next page should begin with a heading (a highest-level heading) that serves as a title for the appendix. If there are two or more appendices, each appendix should begin on a new page and should be titled with a highest-level heading. In these cases, the heading should include the appendix designation (e.g., “Appendix B”) on one line, followed by the heading on the next line (double-spaced), similar to the way the start of a new chapter is handled (see example in Appendix C, Figure C2). Multiple appendices are labeled with capital letters, in order (i.e., Appendix A, Appendix B, etc.).

If necessary for helping readers understand the contents of the appendix, some explanatory text should follow the appendix heading. This would then be followed by the elements of the appendix (tables and/or figures). Running text may also be used throughout the appendix, as needed to explain particular part of the appendix. Running text, tables, and figures are handled the same way in appendices as they are in the main body of the thesis, using the

same format and spacing requirements. Margins and page number location are the same as in the main body; every page following the page titled “Appendix” or “Appendices” must be paginated.

The typeface and spacing used in appendices may differ from those used in the body of the thesis. Documents from a study (e.g., testing tools, survey instruments, etc.) that are presented in an appendix as a figure or table (a figure would generally be most appropriate), should be shown in their original form. Such documents should not be re-typed to conform to normal thesis typeface and spacing requirements, although they may need to be reduced in size to fit within the required margins (similar to the way in which example pages are presented in the appendices of this manual).

Tables and figures within an appendix are presented in the same way as in the body of the thesis, except that their labeling is tied to the appendix. They are not labeled (numbered) as a continuation of the main body. Tables within an appendix (e.g., Appendix B) are labeled sequentially as Table B1, Table B2, etc. Figures are labeled sequentially as Figure B1, Figure B2, etc. If there is only one appendix, tables and figures are labeled A1, A2, A3, etc., even though the appendix itself is not labeled as Appendix A.

Other Conventions

Conventions for format not covered in this manual (such as use of abbreviation, numbers, units, species names, etc.) should follow the guidelines of the *APA Manual*, 6th ed. For conventions not covered in the *APA Manual*, students should refer to an appropriate writing guide, or consult with their thesis advisor and/or the Graduate School.

Tense

Theses and major papers are primarily reports of research performed in the past, as is any previous work that is referenced. However, theses and major papers usually include some discussion that is present commentary. The tense of verbs is an important means of distinguishing between reporting and commentary.

Reporting methods, results, and conclusions: Use of Past Tense. Theses and most major papers present research that is in the past when it is written and read. Thus, the appropriate tense for reporting methods and results, and for drawing conclusions is the past tense. The type of research does not matter (scientific, action research, etc.); research is research. Particular methods were followed, results were obtained, and interpretations of the results were made, all in the past. Methods should not be written in the present tense as essentially a “recipe” or set of directions. They should be written in the past tense, describing what was done. Writers must not generalize and report findings in the present tense as though they are universal or general truths. Researchers sometimes have difficulty presenting findings in the past tense when they are still true, as they presumably are until further research shows otherwise. However, it is this proviso that requires the past tense. If the findings are written entirely in the past tense, they will be accurate not only at the time of writing, but also in the future even if different results are obtained by additional research. An exception to the above information is in MSU's MED program, Action Research Papers. Students completing Action Research Papers should consult their committee chair for tense preferences.

The following is a statement of a result.

Dohler and Wotke (1974) found a sharp increase in prolactin at day 21 (about 40 ng/ml on day 20 and 80 ng/ml on day 21).

If this is written in the present tense, it is changed from a research finding into a statement of generally accepted knowledge:

There is a sharp increase in prolactin at day 21 (about 40 ng/ml on day 20 and 80 ng/ml on day 21).

Making the statement in the present tense is a broad generalization that lacks adequate support.

References to literature should be in the past tense because that research was done and reported in the past. Some writers use the present tense to refer to such previous work to show their confidence in that work, as a courtesy to the authors. However, this conveys an authority that does not, and should not exist in research.

Use of other tenses. In the introduction and discussion sections, the present tense is used for certain types of statements. Writers should apply caution in distinguishing writing about the paper from writing about the research. Writing about the paper is in the present (uses present tense), while writing about research refers to something past (uses past tense).

In discussion sections, the present tense is generally overused. Again, this conveys an authority that does not exist, and the writing becomes a discussion of position rather than a consideration of evidence. The same applies to conclusions. Conclusions may be stated as past or present, but the tense of a statement determines its rigor. In the following examples, statement (a) is the most accurate form. The conclusion is presented as a past inference based on past findings. Specific conclusion, such as (b) must be written in the past tense. Some conclusions

may remain in the present tense, such as (c), but generalized findings like (d) are clearer written in past tense

- a. It is concluded that altitude did not affect the color.
- b. Thus even controlling for skills, unions provided new jobs and promotion ladders to advance mobility of men's work.
- c. The results of the present study seem to provide some evidence about the readabilities and validities that can be achieved by standardized case stimulations.
- d. The close correspondence between the chemical uptake by plants and the RWD indicates [indicated] that the rate of growth was more important than the specific

The present tense is useful for some general discussions, particularly when they involve generally accepted knowledge. It is also useful for describing mathematical relationships, theoretical models, or other discussions of relationships that are not determined by the time of operations.

Future tense is used in research proposals when describing the methods that will be followed, but it has very limited use in a thesis or major paper. The thesis research should be preceded by approval of a research proposal, which typically forms the basis for the first three chapters of the thesis. Students must be careful to change any use of future tense in the methods (what will be done) to past tense (what was done). The only reasonable use for future tense in a thesis or major paper is in describing how certain results will be applied, or what additional research will be done. This could, in some cases, be included in the Discussion chapter.

Chapter 5

Citations and References

References are the bibliographic descriptors of documents cited in a paper. They are provided in the References section at the end of the paper. Citations are the brief formal references (within the thesis) to the documents listed in the References section. Two general types of systems are used in the literature: the citation-sequence and name-year systems.

Theses and major papers must use the name-year system as described in the *APA Manual*. Citations consist of the surname(s) of the author(s) and the year of publication. Author surnames are used to alphabetize the list of references at the end of the document. Some basic aspects of citations and references are described here. For details on incorporating citations and writing references in the References section, students should refer to and carefully follow Chapters 6 and 7 of the *APA Manual*.

Citations

Citations in the name-year system consist of the surname(s) of the author or authors of the cited document and the year of publication. The specific form that they take in the APA style depends on:

- the placement of the citation (e.g., in the running text, parenthetical within the text, in a table note, in a figure caption);
- the number of authors (one, two, three to five, or six or more); and
- in some cases (more than two authors), whether it is the first citation in the thesis, the first citation within a paragraph, or a subsequent citation with a paragraph.

Students are expected to take the time needed to learn the forms that citations take in these various situations.

References

Principles for listing. References to documents cited in the text, figures, or tables should be listed in a section at the end of the document under the heading "References." All references cited, and only references cited, should be listed in this section. The order of references in the reference list is governed by two basic rules.

1. Alphabetic ordering is determined by the first author's surname and then, if necessary, by letter-by-letter alphabetic sequencing determined by the initials of the first author and beginning letters of any following surnames.
2. When the author designation (single or multiple authors) is identical in two or more references, these are sequenced by publication date (earliest to most recent).

There are some additional conventions for special cases.

1. Alphabetize letter by letter. However, when one author surname is the same as the initial letters in another (e.g., Christen and Christenson), the shorter name preceded the longer one.
2. In author surnames, particles such as "de," "la," "van," or "von" are treated as part of the surname, and thus govern alphabetical sequencing. This assumes that the prefix is part of the surname as given on the cited document. This rule applies whether the prefix is capitalized or not.
3. Diacritical marks, accents, and special characters based on the Roman alphabet are ignored. A marked letter is treated as if it was not marked, and ligated letters are treated as if not ligated.

Å [treated as] A Ø [treated as] O ç [treated as] c æ [treated as] ae

4. Initial elements of surnames that are abbreviations are alphabetized as written, not according to the full name or term that the abbreviation represents.

St Louis [not alphabetized as if "St" were "Saint"]

5. Names of Celtic origin beginning with "M' ," "Mac," or "Mc" are alphabetized in the order of the initial letters, not as if "M" or "Mc" represents "Mac". The apostrophe in "M'" is ignored for the purpose of alphabetic sequencing.

The following is an example of a sequence of references determined by these rules (only the author/authors and year are shown).

Jones, G. K. (1973).

Jones, H. P. (1972).

Jones, H. P. (1976).

Jones, Q. T. (1987a).

Jones, Q. T. (1987b).

MacVeagh, G. T., Rosen, H. R., & Smith, M. M. (1945).

McDowell, R. I., Rosen, H. R., & Smith, M. M. (1945).

M'Veagh, E. T., Rosen, H. R., & Smith, M. M. (1931).

National Library of Medicine. (1991).

Neighbors, J. (1976).

Smith, A. L., & Briggs, G. T. (1965).

Smith, A. L., & Dawson, M. T. (1955).

Smith, G. T. (1981).

St Louis, C. H. (1972).

Stickley, B. T. (1977).

Vandelow, M. B. (1965).

von Grautschwitz, E. T. A. (1990).

Form. The format required for references listed in the References section is dependent on the type of the source (journal article, book, chapter in a book, article in an edited volume, internet, etc.). These forms are detailed in Chapters 6 and 7 of the *APA Manual*, 6th ed. and are not repeated here. Students are expected to carefully follow the APA format, making sure that the form follows the appropriate example(s) given in the *APA Manual*.

In a case where there is no example in the *APA Manual* for the type of document being listed, students should refer to the general forms and examples that are most similar to the type of document being referenced. The main goal in such cases is to allow a reader to retrieve the same document; more information is preferable to less.

Chapter 6

Parts of a Table

Tables are used to present a variety of types of information, including:

- data for which precise numeric values are important.
- a large number of numeric values in a compact form.
- a summary of information that is too complex to be easily or concisely explained in the text or shown in a figure.

Tables help to make a document more concise and precise by eliminating the need for monotonous, repetitive text that would be necessary to present a series of numbers or information. However, care must be taken that the tables are presented in a manner that makes them readily and accurately understood. Here are some general guidelines to consider.

1. A table should be complete enough to be understood without continual reference to the text, but it should only contain what is needed for the reader's understanding.
2. A table should be as simple as possible. It should be organized in an orderly fashion, with some logical reasoning for the sequencing of columns and rows.
3. The units, symbols, and data of the table should be consistent with those in the text.
4. Tables containing similar types of information should have parallel formats.
5. When data are presented in very simple tables (only one or two columns and only two or three rows), consider whether the data could be presented just as well in a few sentences in the text.

Parts of a Table

Tables have six major parts: the number and title, column headings, spanners, the stub (containing row headings), the field (containing data), and notes. The parts of a table are illustrated in the example table, labeled Table 7.

Number and title. Each table in a document must have a unique label (table number) and title. Table numbers should be Arabic numerals, and they should be assigned according to the order in which they are referenced in the text. The table numbers are consecutive throughout the body of the thesis (Table 1, Table 2, Table 3, etc.). In appendices, table numbers should be A1, A2, A3, etc. (for a single appendix or Appendix A), B1, B2, B3, etc. for Appendix B, and so on.

The title of the table must be unique, informative, and succinct. It should be a phrase, not a sentence. Terms used in the title should correspond to those used in the text. If abbreviations are used in the title, they should have already been introduced or defined in the text.

Table 1

Parts of a Table

Stub head ^b	Spanner head			Spanner head ^a		
	Column head ^c	Column head	Column head	Column head	Column head	Column head
	Table spanner					
Row head						
Row subhead	xxx	xxx	xxx	xxx	xxx	xxx
Row subhead	xxx	xxx	xxx	xxx	xxx	xxx
Row subhead	xxx	xxx ^d	xxx	xxx	xxx	xxx
	Table spanner					
Row head						
Row subhead	xxx	xxx	xxx	xxx	xxx	xxx
Row subhead	xxx**	xxx	xxx	xxx	xxx*	xxx
Row head						
Row subhead	xxx**	xxx	xxx	xxx*	xxx	xxx
Row subhead	xxx	xxx	xxx	xxx	xxx	xxx

Note. A general note is placed here. General notes are those that explain or provide information relating to the table as a whole. They should end with any requisite explanation of abbreviations or symbols.

^aThe first specific note should begin with a new line. ^bThe second specific note goes here. ^c Longer specific notes may carry over to the next line. ^dThe fourth specific note goes here.

* $p < .05$. ** $p < .01$.

Column headings. The column headings (also known as "heads" or "boxheads") identify the entries in each column. Each column, including the stub, must have a heading. The headings should consist of a word or short phrase that is descriptive of the entries in each column. Sentence style capitalization should be used. When necessary, the appropriate units are set within parentheses. In cases when the column heading consists of units only (does not require

a word or phrase), the units are not placed within parentheses. Caution should be exercised in using symbols (for variables) alone in headings. The meanings of such symbols must be immediately clear from the title of the table and/or the accompanying text. To minimize their size, abbreviations and symbols are used extensively in column headings. However, if such abbreviations and symbols are used only in the table, they must be defined using footnotes to the table.

Spanners. Another method for saving space in the column headings is to combine common elements of adjacent column headings into a spanner head or "straddle heading." The elements of the headings that are unique to each column then become subheadings under the spanner (and each column must have a subheading). Units are placed within the spanner only if they apply to each column that the spanner encompasses. If the units are the only common element for the columns, they are not placed in a spanner (i.e. a spanner should not be used). A "rule" (line) or "spanner rule" should be placed below the spanner such that it covers all of the columns the spanner encompasses.

Spanners that encompass all of the columns in a table are known as table spanners. If used, there must be at least two within the table. A single table spanner should never be used. Such information should be incorporated into the title, or placed in a general note to the table. Table spanners can be used to designate some distinction between two or more parts of a table. A table-wide rule can be used above each table spanner to help make each section of the table and its spanner more distinguishable.

The stub. The stub is the left-most column of a table. It must carry a column heading, known as the stub head. The stub contains the row headings (row heads) that are words or short

phrases that identify the entries of that row in the field. If needed, units should be shown in parentheses (unless the units comprise the entire row heading, in which case no parentheses are used).

Elements that are common to more than one row head can be placed within a row head while reducing the unique elements to row subheads. The row subheads are distinguished by indenting them relative to the row heads. Using row heads and subheads is similar to using spanners for columns.

The field. The field contains the information that the author wants to present. It may be numbers, text, or symbols, but the nature of the information should be clear from the table's title and column and row headings. Each entry is placed in a *cell* at the intersection of the appropriate column and row.

Each column of entries should be aligned with its respective column heading, either flush left or centered. If a column contains only numeric values, and all are in the same units, the entries should be aligned on the decimal point. Numbers that are summed are generally presented in columns rather than rows. If the totals are not the exact sum of the numeric values in a column or row, they should be identified with an explanatory note (e.g. "Values in the columns may not add up to the totals due to rounding").

When the field entries consist of text, they should be as concise as possible. Text entries should use sentence-style capitalization. If more than one line is required for the entries, they should be left-justified and single-spaced. When the field entries consist of text there should also be a blank row separating the entries.

Empty cells in a table must be treated carefully. If a table contains a large number of empty cells, perhaps the table needs to be redesigned. In many cases, the use of some empty cells is unavoidable. It is generally best to designate empty cells in some manner, such as placing an em-dash (–) in the cell. Leaving the cell empty may cause the reader to wonder whether the cell should be empty or there was some type of typographic error. Abbreviations may be used to convey the reason for the blank cell, but the meaning of such abbreviations must be clear. Abbreviations used in the table field should be defined in a general note.

Notes. Notes (footnotes) are used to present information that does not fit into the structure of the table and is not readily available in the accompanying text. There are three types of notes: general, specific, and probability notes. These are placed below the table, in this order (although not every table will require each type).

A general note is used to explain or provide information relating to the table as a whole. When appropriate, the source of the information in the table should be detailed in a general note, if necessary along with a statement that the table was reprinted or adapted with permission (when taken from a copyrighted source). The APA Manual shows examples of such notes. When necessary, a general note ends with explanation of any abbreviations or symbols (unless standard) used in the table.

Specific notes are those that refer to only a specific part of the table (a spanner, column, row, or individual entry). Superscript lower case letters should be used as signs to direct the reader to the appropriate specific note. Letters are assigned starting with the column headings from left to right starting with the stub heading, then down through the table. Specific notes are placed in alphabetic order below the general note, or below the bottom rule of the table when

there is no general note. The first specific note should start a new line; it should not be in line with, or a continuation of a general note. Additional specific notes should follow in order. Sentence-style capitalization and punctuation should be used for each note (i.e., each should end with a period).

A probability note is used to indicate the results of tests of significance. In the body of the table, asterisks are used to indicate values for which the null hypothesis is rejected. The probability (p) value(s) is/are specified in the probability note. Each alpha level is assigned a certain number of asterisks. In theses containing more than one table for which probability notes are required, the designations should remain consistent among the tables. Highest probability values receive the fewest asterisks (see the example Table 7). If distinction must be made between probability values and between one-tailed and two-tailed tests, use asterisks for two-tailed p values, and daggers (\dagger) for single-tailed tests. For example, the probability note may be:

$*p < .05$, two-tailed. $**p < .01$, two-tailed. $\dagger p < .05$, one-tailed. $\dagger\dagger p < .01$, one-tailed.

Format of Tables

The label and title of a table appear above the table. The label (e.g., Table 3) is written on a separate line in non-italicized typeface. It is followed by one blank line, and then the title. Titles should be capitalized, except for minor words (e.g., of, to, for, or, and), with no punctuation at the end. Titles should be written in italicized typeface. Both the label and the title should be left-justified (Appendix B, Figures B4-B6). Titles longer than a single line should be single-spaced (Appendix B, Figure B5). The APA Manual states that there should be no blank line between the title and the top of the table. However, titles may be difficult to read with no space between them and the top rule of the table. This creates a small separation between the

title and the top of the table that can make the title more distinguishable and much more readable.

Rules should be limited to those that are necessary for clarity, and should generally be restricted to horizontal rules. Proper spacing of columns, and alignment within columns can generally eliminate any need for vertical rules. Each table should have at least three table-wide horizontal rules: one at the top, one offsetting the stub head and column heads from the body, and one at the bottom (separating the body from any notes provided with the table). Additional horizontal rules can be used to separate portions of the table when table spanners are used (with the rule placed above the table spanner), but excessive use of rules should be avoided. Rules should not be used to separate each row. Shorter horizontal rules should be used when the table contains column spanner heads. These rules, placed below each column spanner head, must span the full width of the columns to which the spanner head refers. There must be some space between adjacent column spanner head rules; they should not run together such that they form a single horizontal rule. When tables are created using table tools of word processing programs, in which the cell borders are used to create rules, inserting a narrow, empty column can create the necessary spacing.

According to the APA Manual, line spacing for tables is not specified; they may be single-spaced or double-spaced. The primary consideration should be readability. The typeface and font size used in the table should be the same as that used in the main text, except when another typeface is required by a special symbol (e.g., italicized statistical symbols). Notes for a table may be typed in a smaller font size (but the same typeface). For example, if 12-pt Times New Roman is used for the main text, and in tables, the notes can be typed in 10-pt Times New

Roman. There should be a modest space (no more than one blank line) between the bottom rule of the table and the start of the note(s).

Some tables may be too large to fit on a single page (see example in Appendix B, Figure B4). To be placed on a single page, any notes for the table must also be able to fit on that page. When the table is too large, the table must be divided (vertically, horizontally, or perhaps both) and shown on two or more adjacent pages. Such tables should be on pages by themselves, without running text. Appropriate column heads and row heads must be repeated for each portion of the table. The table label (e.g., “Table 3”) is shown above each portion of the table. The table title is only shown above the first portion of the table. Above subsequent portions, the “title” is changed to “*Continued,*” as shown in the example of Figure B6. Table notes are placed at the end, below the last portion of the table.

Placement of Tables

Tables are integrated into the thesis or paper, not placed at the end or at the ends of chapters. Larger tables should be placed on a page of their own. Smaller tables may appear on a page that also contains main text. A good general guide is that if the table (including notes) takes up more than half of the vertical space available on a page, it should appear on a page of its own. When a smaller table appears on a page with main text, it must be sufficiently separated from the main text so it is easily distinguished. Use a minimum of triple spacing (i.e., two blank lines) to separate main text from the top or bottom of a table (from the table label or the bottom line of a table’s notes).

Each table should be placed in the first available, appropriate space following the first reference to the table in the text. For larger tables, the first appropriate space is on the next page.

Such tables may begin at the top of the page, or they may be “centered” on the page. In the case of a smaller table that appears on a page with main text, the first appropriate space may be on the same page as its first reference, or it may be the top of the next page. Here are some guidelines to follow regarding smaller tables (keeping in mind the requisite spacing between tables and main text).

- If there is sufficient space remaining on a page to place a table after the paragraph that contains its first reference, place the table there.
- If there is sufficient space remaining on a page to place a table after the line in which it is first referenced, but insufficient space following the end of the paragraph, authors should break the paragraph at the end of a line, and place the table in the remaining space on that page.
- If there is insufficient space to place a table on the page following its first reference, the table should be placed at the top of the next page. This placement will typically require a break in a paragraph.

Tables must be placed in the correct order. A table should never be placed before a lower-number table, even if space allows. Consider the following example. Two tables (Table 16 and Table 17) are referenced on a particular page. Table 16 is a large table that must be placed on a page of its own, and Table 17 is a small table. Following the paragraph in which Table 16 and Table 17 are referenced, sufficient space remains on the page for placement of the smaller Table 17. However, it cannot be placed there because Table 16 has not yet been presented. Table 17 would have to be placed at the top of the page that follows Table 16.

Referencing Tables

Every table must be referenced in the text. Tables should be referenced in the text by their number. The word “Table” must be capitalized, and written out (i.e., not abbreviated).

As shown in Table 6, the subjects...

Analyses of the coal ash (Table 3) show that...

Spatial references such as “the table below”, “the table on the next page”, or “the table on page 53” should not be used. Such references may be ambiguous, and may become incorrect as the thesis is modified during the editing process. References to tables by their number will never be ambiguous, nor will they have to be modified during editing because the position of a table has changed.

Chapter 7

Figures and Plates

Figures

Figures are used to present certain types of information. Some are used to present data for which trends or proportions are the important characteristic. Some are visual aids to the understanding of complex concepts. Others are drawings or photographs of items, places, or procedures discussed in the text. Figures include a variety of types of illustrations such as graphs, photographs, drawings (including maps), and diagrams.

Graphs include X-Y (covariation or scatter) diagrams, contour diagrams, bar graphs, and pie graphs. Each has its own particular value for showing certain things (relationships between variables, spatial distribution of a variable, comparison of values, values of the parts of a whole).

Photographs provide realistic depictions of images/events. Although the advantage is realism, the potential disadvantage is that too much detail can confuse the reader about the important aspects the author is trying to get across.

Drawings are somewhat realistic depictions. They may provide an advantage in that the level of detail can be controlled, which may help the author to avoid unnecessary and potentially confusing details. A map is one type of drawing that is used to present scaled spatial relationships.

Diagrams are drawings that communicate through symbols. They are used to show how different parts of a system relate to one another, but they are not used to depict physical characteristics of objects.

Parts of a Figure

Body. The body is the main element of a figure: the chart, graph, photograph, line drawing, etc. The body includes any labels that are necessary to make the parts of a figure understandable. When necessary, it also includes an explanation, sometimes called a legend or key. The explanation identifies the meaning of symbols used in the figure. Although symbols could sometimes be explained in the figure caption (small number of simple symbols), detailing their meaning in an explanation is a more visual and more effective approach. Abbreviations used in labeling parts of a figure are handled differently; these are explained in the figure caption.

Figure numbers and captions. Each figure must have a figure number and a caption. The figures should be numbered consecutively throughout the document (Figure 1, Figure 2, Figure 3, etc.) in the order in which they are first referenced in the text. In appendices, figure numbers should be A1, A2, A3, etc. (for a single appendix or Appendix A), B1, B2, B3, etc. for Appendix B, and so on. The figure number and caption are placed below the figure.

The caption should describe in a short form the content of the figure; it is not a title. Phrases or incomplete sentences may be used, but they should be capitalized and punctuated in sentence style. If the caption requires more than one line, double spacing should be used. Abbreviations or symbols that are included as part of the figure, but not explained in the figure, should be explained (defined) in the caption. An example figure is shown here as Figure 2.

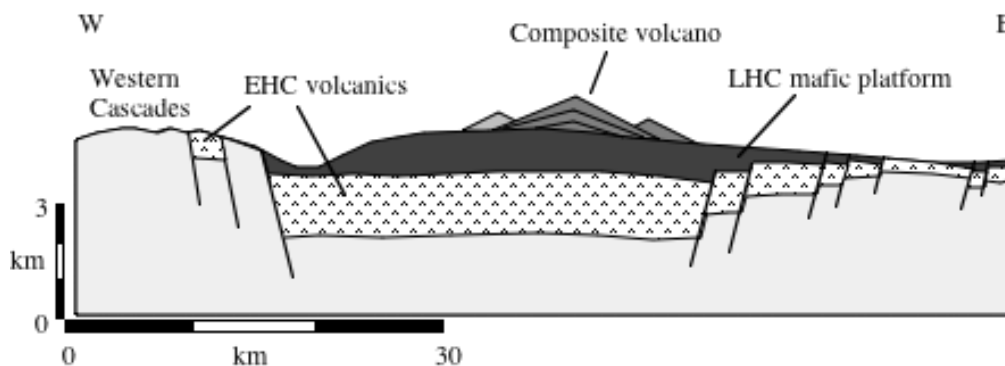


Figure 2. (Example of a figure) Generalized east-west cross-section of the central Oregon High Cascades graben (3× vertical exaggeration). Pliocene (2-7 Ma) Early High Cascade (EHC) volcanics filled much of the graben. Quaternary (< 2 Ma) Late High Cascade (LHC) volcanics consist of a mafic platform and overlying composite volcanoes.

Preparation of Figures

There are several goals to keep in mind when preparing figures. These are to be precise, clear, fluid, and anchored in the familiar.

The precision of the illustration should reflect the precision of your language. Details that are not self-explanatory or explained in the text should be avoided. Authors don't always want a picture to be worth a thousand words. Extraneous details should not stand out so much that they overshadow the important details. Appropriate language is needed to mesh the illustration into the document. When it is introduced and assigned a formal name (e.g., Figure 1), enough information should be provided in the text and in the figure's caption so the reader understands what the figure is and how it fits into the document. The information in the text should match the information the figure conveys. The caption should allow the figure to stand on its own to some extent. The caption should provide enough information that it answers any immediate questions that may arise from looking at it.

The figure should be anchored in the familiar as much as possible. To do this, authors should consider what the audience does and does not know. They must try to see the illustration the way the audience does (not always an easy task because one is so familiar with the details of one's work). The scale must be adequately conveyed on illustrations where scale is important.

The mechanics of putting an illustration together should reflect these goals. The figure must also be readable (without a magnifying glass). Text within a figure should be large enough to be easily read, but not so large that it unnecessarily overwhelms other aspects of the figure. Very often, figures are produced at a larger scale than what will go into the document. Then it is reduced to fit within the space constraints of the document. All text must be readable once it is reduced to its final size. Authors should not try to cram too much into one figure. There are cases when separating a figure into more than one will allow greater precision and clarity.

Format of Figures

Quality. Figures should be professional in their appearance. Acceptable figures can be produced or modified by hand, but this requires some skills in drafting. Most figures now are generated using computers, and they are incorporated electronically. Hand-drafted figures can still be incorporated electronically, using a scan of the figure. In such cases the scan must be of sufficiently high resolution that the quality of the figure is not degraded in the final document. A hand-drafted figure may also be incorporated by fixing it to the appropriate space on the page, and photocopying that page (being careful that no shadows are created along the margins of the figure that was fixed to the paper). A better approach is to obtain a high-resolution scan of the figure, which can then be incorporated electronically into the thesis.

Lines, symbols, and lettering should not be drawn “by hand” (freehand). This does not mean that hand-drawn figures can never be used; in some cases they must be used. For example, if a study involved subjects who created drawings, these drawings (when needed) can be (and should be) incorporated as figures in their original form. A high-resolution scan can be used to incorporate such figures electronically.

Size. The size of a figure must be such that it can fit within the required margins. Figures produced by computer are often prepared at a larger size. Once incorporated electronically, these can be easily scaled to fit. However, in its final form (size), it must meet other format requirements. Also, authors must be careful that the figure is not distorted; the aspect ratio of the figure must be maintained when modifying its size. Some figures may consist of more than one part (panels). For example, a figure may contain two graphs or photographs placed side-by-side or stacked. As with any figure, those with multiple panels must fit within the required margins.

Parallel figures (i.e., similar in their nature and importance) should be similar in their composition and overall size. They should be prepared using the same scale.

Lettering and symbols. The APA Manual guidelines state that letters within figures should be no smaller than 8 pt and no larger than 14 pt. While variation in the sizes of lettering can add to the clarity of the figure, too great a variation can be awkward or distracting. The typeface used should be simple. San serif typefaces such Arial, Futura, or Helvetica work well; roman typefaces such as Times New Roman do not. Letter should be clear and not run too close together. Use of modified typeface (boldface, italicized, etc.) should be considered carefully. All text must be legible and remain legible once reproduced.

In figures with multiple panels, each panel should be labeled. The labels should be 14 pt capital letters (A, B, etc.) placed at the upper-left corner of each panel.

Photographs and color figures. Photographs printed on photographic paper may be incorporated as a figure or panel within a figure in a thesis by securely fixing the photograph to the page. When this is done, it must be done for each required final copy of the thesis. The quality of printers available now makes it easier to incorporate photographs electronically, but an “original” printed page must be generated for each final copy of the thesis. The same applies to any figures produced in color. An original color printing of the appropriate page(s) must be placed in each final copy.

Labels and captions. The label and caption for each figure is placed below the figure, with one blank line separating the figure and the label-caption. The word “Figure” is followed by a space, the number of the figure, and a period. The label (e.g., *Figure 7*) should be italicized. The caption begins (with a space after the period) on the same line. It should be written using the normal typeface (not italicized except when required by the format of an abbreviation or symbol). Incomplete sentences may be used within figure captions, but must still use sentence-style capitalization and punctuation. Captions requiring more than one line should be double-spaced.

One exception to the placement of the label-caption below the figure occurs when the figure itself takes up the entire page, or enough of the page such that the caption cannot be properly placed below the figure. Reducing the size of the figure such that the caption can fit properly below it may be an acceptable solution. If reduction compromises the legibility of the figure, it should not be reduced. In such cases, the figure caption should be placed on a page of

its own immediately preceding the figure. The caption should be centered vertically on the page. There is no need to state within the figure caption that the figure is on the next page. By convention, a caption alone on a page signifies that the figure is located on the next page (Figure B8).

Placement of Figures

Figures are integrated into the thesis or paper, not placed at the end or at the ends of chapters. Figures should be placed on a page of their own (see example in Appendix B, Figure B7). Each figure should be placed on the page that follows the first reference to the figure in the text. Figures may begin at the top of the page, or they (figure and caption) may be “centered” vertically on the page. Figures must be placed in the correct order.

Referencing of Figures

Every figure must be referenced in the text. Each figure should be referenced in the text by its number. The word “Figure” must be capitalized, and written out (i.e., not abbreviated).

As shown in Figure 6, the concentration of...

Analyses of the coal ash (Figure 3) show that...

Spatial references such as “the figure below”, “the figure on the next page”, or “the figure on page 53” should not be used. Such references may be ambiguous, and may become incorrect as the thesis is modified during the editing process. References to figures by their number will never be ambiguous, nor will they have to be modified during editing because the position of a figure has changed.

Plates

Plates are distinguished from figures because they are illustrations that require special printing in that they must be printed on a special type of paper or a larger piece of paper because they are too large to fit within the space constraints of a normal page. The general guidelines used for preparing and referencing figures apply to plates as well. Plates should be numbered sequentially throughout the document (Plate 1, Plate 2, etc.) in the order in which they are referenced in the text. The plates themselves must be labeled with "Plate" followed by the number, and then a caption.

Normally, plates will be printed on larger paper. In some cases they may be printed on letter-sized paper, but with smaller margins that do not allow it to be bound with the thesis. In any case, the plate(s) should be folded appropriately and placed in a pocket that is securely fixed to the inside of the back cover of the thesis. If the plates, when placed in the pocket, do not protrude very much, it may be possible to simply add the pocket and plates to each normally bound thesis. However, if the pocket and plates are going to be too thick to allow the bound thesis to close properly, the bound pages of the thesis should include an appropriate number of blank pages (thick enough to accommodate the plates). These blank pages will then have to be trimmed as close as possible to the binding. This creates a gap in the back cover that will allow for proper closure of the thesis with the pocket and plates are added. Students may need to work directly with the binder to make sure this is done properly. Most binders should have experience in adding and trimming “spacer pages” to accommodate a back pocket.

Chapter 8

Major Papers

The requirements for students completing the major papers option (the “two papers” option) are the same as for students completing a thesis. The basic organization used for both papers should be the same as a thesis. This includes the title page, abstract, chapters, references, and appendices; both papers are handled just like a thesis. The major differences in the case of the two papers option are in the preface materials. The general layout for major papers is shown in Figure 8.1.

Preface Materials

The preface materials are somewhat different from those of a thesis. There is a main title page that shows the titles of both papers. There must be two approval pages, one for each paper. A single Acknowledgments page follows the approval pages. There is no abstract given in the preface materials; these are built into the body of the two papers. The Acknowledgments page is followed by the Table of Contents, List of Tables, List of Figures, and (if necessary) List of Plates.

Main title page. The first page is a main title page that essentially the same as it is for a thesis except that it lists two titles. The two titles, if more than one line each, should be single-spaced within. They should be separated by the word “and” (centered), with double spacing between the titles and the word “and.” Below the titles is a statement that starts “Two Papers Submitted in...” rather than “A Thesis Submitted in...” The remainder of the main title page is written as it would be for a thesis. The main title page is counted in the page numbering of

preface material, but it is not paginated. An example main title page is shown in Appendix D, Figure D1.

Approval pages. Two approval pages follow the blank or copyright page. They will be identical, except for the titles of the papers. The format is exactly the same as for a thesis except that they should state “This paper was submitted by” rather than “This thesis...” Example approval pages are shown in Appendix D, Figure D2.

Acknowledgments. A single Acknowledgments page (section) follows the second approval page. The acknowledgments are written as they would be for a thesis. There is no subdivision of the acknowledgments by paper, but for acknowledgments that relate to the work for just one of the papers, it should be clear that this was the case.

Table of contents and lists of tables, figures, and plates. The formats of the Table of Contents, List of Tables, List of Figures, and List of Plates are identical to the formats used in a thesis. The only difference is that each is separated into two sections, using the titles of the two papers as headings. Examples of these parts of the preface materials are shown in Appendix D, Figures D3-D6.

The Papers

The “body” of the two papers differs somewhat from the body of a thesis. For both papers, there must be a title page and an abstract that precedes Chapter 1. Following the five chapters, both papers must have their own References section, and their own appendix or appendices (if necessary). In other words, the two papers must be “self-contained”, such that a reproduction (photocopy) of one paper would include everything that goes with that paper (except for preface materials).

Tables, figures, plates, and appendices. Within both papers, the referential items (tables, figures, plates, and appendices) should be numbered separately. For example, the tables in the second paper should be numbered Table 1, Table 2, etc. The table numbers do not carry over from the first paper.

Page numbers. Page numbering is handled as it is for a thesis. All pages of the thesis are counted with the exception of the blank or copyright page that follows the main title page. All preliminary pages (all pages prior to the first page of the first paper) should be numbered with lower case Roman numerals. The only exception is the main title page, which is assigned a page number (i.e., counted as page i), but it is not paginated. Beginning with the title page of the first paper, and continuing through the References and any appendices of the second paper, all pages are counted and paginated (with some exceptions) with Arabic numerals. The only pages that are not paginated are the two title pages at the start of both papers, the first page of each chapter, and the pages (if present) labeled “Appendices” or “Appendix.” An example of the first four pages of the first paper is shown in Appendix D, Figure D7.

The placement of page numbers, whether Roman or Arabic numerals, is the same as it would be for a thesis (see Section 4.3). They should be located inside of the right-hand 1-inch margin, and no closer than 1.0 inch from the top of the page.

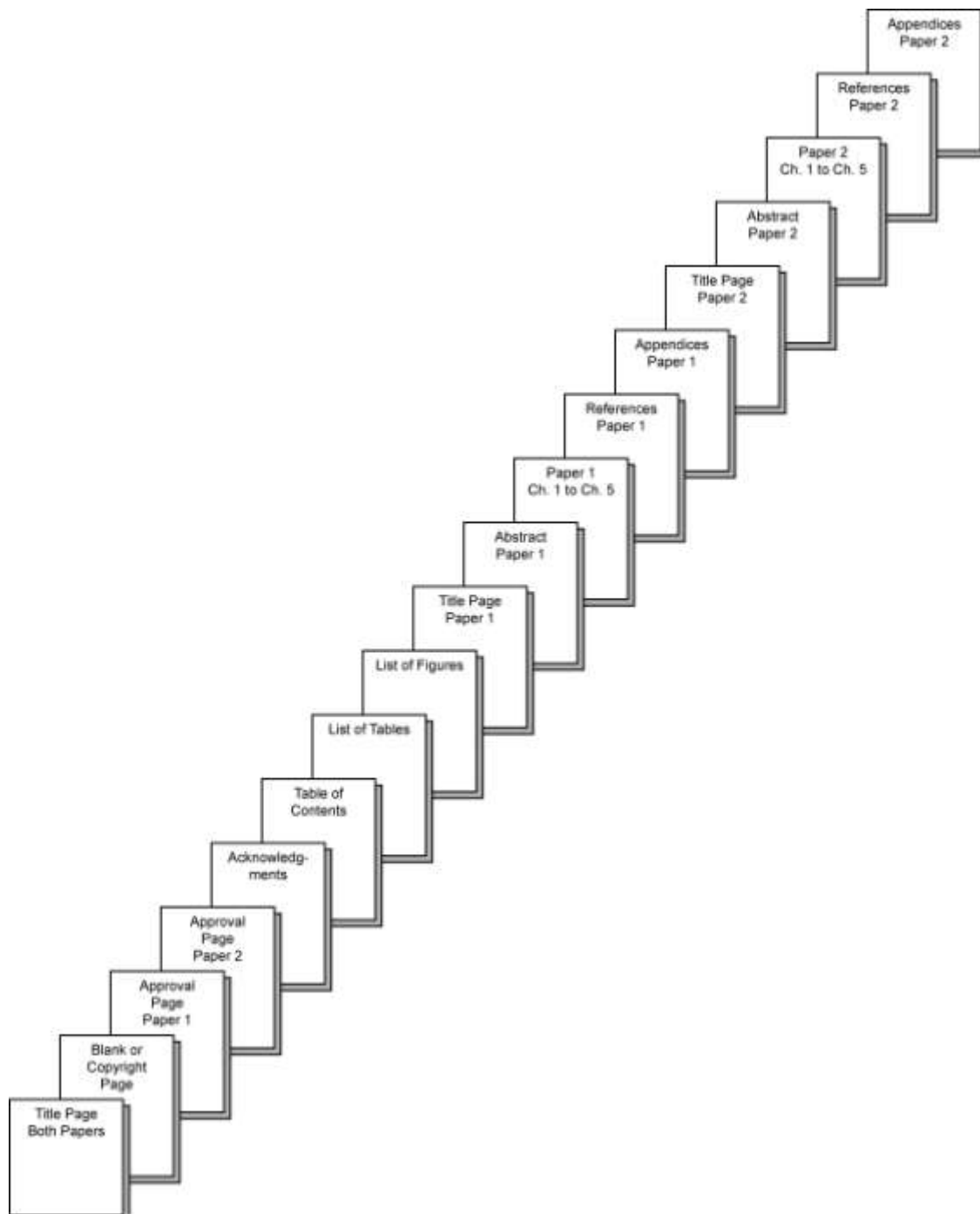


Figure 3 Page layout for the major papers option.

Appendices

Appendix A

Example Preliminary Material Pages

This appendix presents examples of pages from the preliminary materials of a thesis. Full 8.5 x 11-inch pages are shown (the black border indicating the edges of the page), but are reduced to 75% of their full size so that they fit onto these pages along with captions. Margins are at 1.5 inches on all sides.

Heavy Mineral Analysis of Late Eocene Sandstones
of Southwestern North Dakota

A Thesis
Submitted in Partial Fulfillment of
the Requirements for the Degree of
Masters of Arts in Teaching

John Seymour Rocks

Division of Science
College of Arts and Sciences

Graduate School
Minot State University
Minot, ND

Spring 2009

Figure A1 Example Title page.



Copyright 2009 John Seymour Rocks

Figure A2 Example Copyright page. This page is not numbered, nor is it counted.

ii

This thesis was submitted by

John Seymour Rocks

Graduate Committee:

Dr. John Webster, Chairperson

Dr. Allen Kihm

Dr. Ryan Winburn

Dr. Robert Crackel

Dean of Graduate School

Dr. Linda Cresap

Date of Defense: April 1, 2009

Figure A3 Example Approval page.

Abstract

The Chalky Buttes Member (CBM) sandstone (lower Chadron Formation) is exposed at a number of buttes in southwestern North Dakota. The Medicine Pole Hills (MPH) sandstone, exposed south of Rhome, North Dakota, has been correlated with the CBM sandstone. Heavy mineral analyses of the MPH sandstone and two samples of the CBM sandstone, collected from Rattlesnake Butte (RSB) and Square Butte (SQB) have been used to test this correlation. Heavy mineral grains were separated from fine to medium sand, mounted on glass slides, partially ground, polished, and coated with carbon. The grains were identified using optical microscopy and a scanning electron microscope – energy dispersive spectrometer (SEM-EDS) system. The analyses showed that the MPH sandstone heavy minerals were dominated by diopside and hornblende, with modest abundances of epidote-clinozoisite, augite, and almandine garnet. The two CBM sandstones yielded rather different results from the MPH sandstone, and from one another. The RSB sample was dominated by epidote-clinozoisite, biotite, and almandine garnet, with modest abundances of ilmenite and pseudobrookite. The SQB sample was dominated by rutile, with modest abundances of epidote-clinozoisite, pseudobrookite, ilmenite, staurolite, aluminosilicate (probably kyanite), apatite, and tourmaline. Results suggest that the MPH sandstone had a source quite distinct from those of the CBM samples, and should not be correlated with the CBM sandstone.

Figure A4 Example Abstract page. (Reader please note: Double spacing is preferred following the heading for simplicity in keying the document. However, many of the examples illustrate a larger space following the heading; additional spacing is acceptable if it improves document readability).

Acknowledgments

Throughout this project, several people have been instrumental in keeping me on track. I am most grateful to Dr. John Webster and Dr. Allen Kihm for their guidance and patience. I would also like to thank the Division of Science for access to the equipment and instrumentation needed for this research.

My family has been supportive throughout the entirety of this endeavor. I would like to extend my gratitude to my wife and children for tolerating my occasional absence from family life.

Figure A5 Example Acknowledgments page.

v	
Table of Contents	
	<i>Page</i>
Abstract	iii
Acknowledgments	v
List of Tables	vii
List of Figures	viii
List of Plates	ix
Chapter 1: Introduction	1
Chapter 2: Review of Literature	5
Heavy Mineral Sources	5
Heavy Minerals of the Williston Basin	7
Heavy Minerals of the White River Group	11
Chapter 3: Methods	13
Field Work	13
Sample Preparation	13
Disaggregation and grain-size separation	14
Heavy mineral separation	15
Grain mount preparation	17
Optical Microscopy and SEM-EDS Analysis	18
Cluster Analysis	19
Chapter 4: Results	21

Figure A6 Example Table of Contents pages.

	vi
Chapter 5: Discussion	23
Comparison of MSU Results	23
Comparison of MSU Results with Chadron Formation Results	23
Opagues.....	26
Diopside, pyroxenes.....	26
Hornblende.....	26
Aluminosilicates	26
Staurolite	26
Ultra-stable minerals	26
Significance of Heavy Mineral Comparisons	27
Implications for Correlations	28
Cluster Analysis: Heavy Mineral Assemblage Types	33
Tertiary volcanics (TV).....	36
Tertiary volcanic or Precambrian (TV/PC).....	36
Precambrian (PC).....	38
Recycled or Precambrian (RC/PC)	38
Conclusions.....	42
Future Research	43
References.....	45
Appendix A: Stratigraphy of Sample Sites	49
Appendix B: Chemical Compositions of Select Heavy Minerals.....	58

Figure A6 Continued.

vii

List of Tables

<i>Table</i>	<i>Page</i>
1. Non-opaque Heavy Mineral Compositions (Grain %) of Modern Sediments	8
2. Heavy Mineral Compositions (Grain %) of Tertiary Strata of the Southwestern Williston Basin Area	10
3. Non-Opaque Heavy Minerals (Grain %) of the White River Group	12
4. Heavy Mineral Compositions (Grain %) of Eocene Sandstones – MSU Studies	26
5. Comparison of MSU Heavy Mineral Compositions (Grain %) with the Chadron Formation.....	24
6. Average Compositions (Grain %) of the Heavy Mineral Assemblage Types	35
7. Summary of Dominant Minerals (Grain %) and Source Types for the Heavy Mineral Assemblage Types	37
B1. Representative chemical analyses of garnet grains	59
B2. Representative chemical analyses of pyroxene grains	62
B3. Representative chemical analyses of epidote grains	65
B4. Representative chemical analyses of hornblende grains	69

Figure A7 Example List of Tables page.

viii

List of Figures

<i>Figure</i>	<i>Page</i>
1. Map of southwestern North Dakota buttes	2
2. Generalized stratigraphic column for Tertiary strata of North Dakota	3
3. Summary of the six lithogenetic Tertiary units of Denson and Chisholm (1971)	6
4. Apparatus for recovery of heavy minerals from centrifuge bottles	16
5. Comparison of Eocene sandstone sources based on heavy minerals	32
6. Cluster analysis dendrogram with subdivisions into five heavy mineral assemblage types	34
7. Map of geographic and stratigraphic distribution of heavy mineral assemblage types	39
8. Map of overall geographic distributions of heavy mineral assemblage types	41
A1. Stratigraphy of the Medicine Pole Hills site	50
A2. Stratigraphy of the Rattlesnake Butte site	52
A3. Stratigraphy of the Square Butte site	54

Figure A8 Example List of Figures page.

ix

List of Plates*Plate*

1. Example heavy mineral grain map
2. Geologic map of southwestern North Dakota showing buttes and locations of heavy mineral samples

Note. Plates are located in the pocket of the back cover.

Figure A9 Example List of Plates page.

Appendix B

Example Thesis Body Pages

This appendix presents examples of pages from the body of a thesis. Full 8.5 x 11-inch pages are shown (the black border indicating the edges of the page), but are reduced to 75% of their full size so that they fit onto these pages along with captions. Margins are at 1.5 inches on all sides.

Chapter 2

Review of Literature

Denson and Chisholm (1971) reported the general heavy mineral compositions of Tertiary strata of the middle Rocky Mountains and northern Great Plains based on the study of 3,000 heavy mineral separates from 200 stratigraphic sections. For most samples, heavy minerals were separated from the fine sand fraction (0.063-0.125 mm); for a limited number of samples, the coarse silt fraction (0.031-0.063 mm) was used. Non-opaque grains (100 or more per sample) were identified by optical microscopy.

The changes in heavy minerals throughout Tertiary strata reveal changing sources that correspond to tectonic and volcanic episodes in the middle Rocky Mountains and northern Great Plains. Denson and Chisholm (1971) reported six major lithogenetic units (Figure 3).

Heavy Mineral Sources

Denson and Chisholm (1971) reported that the three basic sources for heavy minerals in Tertiary strata were: (1) recycled sediment derived from Paleozoic and Mesozoic sedimentary rocks, (2) Precambrian plutonic and metamorphic rocks exposed in the cores of mountain ranges, and (3) Tertiary volcanic rocks. A summary of the dominant heavy minerals derived from these three sources, as given by Denson and Chisholm, is as follows:

1. Recycled: tourmaline, zircon (pinkish-violet plutonic)

Figure B1 Example first page of a chapter.

2. Plutonic and Metamorphic: blue-green hornblende, garnet, epidote, zircon, tourmaline and gray-green biotite.

3. Volcanic: green-brown hornblende, red oxyhornblende, augite, hypersthene and red-brown biotite.

Sato and Denson (1967) studied the heavy mineral compositions of sediment in streams draining Precambrian plutonic and metamorphic mountains and of Tertiary volcanics (ash deposits). A summary of their results is given in Table 1. These results show the dominance of blue-green hornblende, garnet, and epidote for Precambrian plutonic and metamorphic sources, and the dominance of green-brown hornblende and pyroxene (mostly augite) in volcanic sources.

Heavy Minerals of the Williston Basin

Denson et al. (1965) reported heavy mineral compositions of Cretaceous and Tertiary strata exposed at buttes in southwestern North Dakota, southeastern Montana, and northwestern South Dakota (Table 2). Of significant result was the general dominance of opaque heavy minerals in most Fort Union Group samples and the White River Group Chadron Formation. The opaque minerals consisted largely of magnetite (up to 50% in some samples), ferruginous and clay aggregates, leucoxene, and pyrite. Non-opaque minerals dominated in the White River Group Brule Formation, in the Arikaree Formation, and to a lesser extent in the Fort Union Group Ludlow Formation. Among the non-opaque heavy minerals, some significant variations included: (1) a decreasing abundance of garnet with time, (2) a close similarity between the Sentinel Butte and Chadron Formations,

Figure B2 Example “normal” page from a thesis including a Level-2 heading.

divided into three sets, and the entire sample was run through a set before the next set was used. Approximately 100 g of sample at a time were run through a set of sieves, with the sieve shaking running 10-12 minutes each time. The sieves were emptied onto labeled sheets of butcher paper after each two 100-g batches. Each grain size fraction was stored in an appropriate labeled plastic bag, and the weight of each fraction was recorded.

Heavy mineral separation. Heavy minerals were separated from the selected grain size fraction(s) using a heteropolytungstate solution (LST) with a density of 2.85 g/cm^3 . Separation was carried out in 500-mL centrifuge bottles, each filled with approximately 200 mL of LST. The number of bottles used was dependent on the number of size fractions used, and the amount of sand in each fraction. The amount of sand in each bottle was kept to 75 g or less. The centrifuge was run at 2000 rpm for 30 minutes.

Heavy minerals were recovered from the bottom of the bottles using a vacuum extraction tube (Figure 4). A hollow glass tube with a cone-shaped plastic cap on the bottom end was slowly inserted into the centrifuge bottle through the layer of light minerals. The plastic cap was used so none of the light minerals at the top of the bottle would enter the tube. Once the glass tube was through the top minerals, a thin glass rod was used to push out the cap. A smaller glass tube attached to a vacuum system was then inserted through the first tube so its end was just above the heavy minerals that collected at the bottom of the centrifuge bottle. Heavy minerals were transferred by vacuum suction into an Erlenmeyer trap flask. The heavy minerals that were recovered in the flask were filtered,

Figure B3 Example “normal” page from a thesis including a Level-3 heading.

Table 3

Non-Opaque Heavy Minerals (Grain %) of the White River Group

	Intermontane Basins (26)	Williston Basin (14)	Northern High Plains (165)
bl-gr hornblende	4	3	14
gr-br hornblende	62	56	41
rd-br hornblende	2	2	1
total hornblende	68	61	56
hypersthene			
augite	4	6	4
diopside			1
total pyroxene	4	6	5
biotite		16 ^a	1
garnet	7	5	7
epidote	12	4	5
zoisite	1	1	
actinolite			
sillimanite	1		1
sphene	2	3	7
apatite			
zircon	5	2	13
tourmaline		1	1
rutile			1

Note. Numbers in parentheses indicate the number of samples analyzed. Abbreviations used: bl-gr, bluish-green; gr-br, greenish-brown; rd-br, reddish brown. Data are from "Volcanism and tectonism as reflected by the distribution of nonopaque heavy minerals in some Tertiary rocks of Wyoming and adjacent states," by Y. Sato and N. M. Denson, 1967, *USGS Prof. Paper 575-C*, p. C49. Copyright 1967 by the U. S. Geological Survey. Adapted with permission.

^a 13% green biotite; 3% reddish-brown biotite.

Figure B4 Example large table. Large tables are shown on a page by themselves. (Reader please note that the illustration above is incorrect; the table should extend to the right margin.)

Table 7

Summary of Dominant Minerals (Grain %) and Source Types for the Heavy Mineral Assemblage Types

	Dominant Minerals	Source Types	Localities / Samples
Type A	Ztr + eSag	PC/RC ≈ PC	
A1	Ztr > eSag	PC/RC > PC	Chalky Buttes (10), Slide Butte (50), Black Butte (3) White Butte (8), Young Mans Butte (45), Slim Buttes (25) Long Pine Hills (30)
A2	eSag > Ztr	PC > PC/RC	Chalky Buttes (5), South Cave Hills (3, 8, 11, 15, 22), Slim Buttes (15), Slide Butte (25, 55), Coal Butte (25), Taylor Butte (20)
Type B	Esag > Ztr > B	PC > PC/RC > TV/PC, TV	Chalky Buttes (35, 45), Rattlesnake Butte (MSU), Whetstone Butte (10), Long Pine Hills (15)
Type C	ztr ≈ Esag	PC/RC ≈ PC	Square Butte (MSU)
Type D	B > H, Esag > Ztr	TV > TV/PC	Whetstone Butte (55)
Type E	D > H > Esag	TV > TV/PC	Medicine Pole Hills (MSU)

Note. Samples with numbers in parentheses are from Denson and Gill (1965); the numbers represent stratigraphic position in feet above the base of the Chadron Formation.

Figure B5 Example large table with a multi-line title.

Table 5

Comparison of MSU Heavy Mineral Compositions (Grain %) with the Chadron Formation

	White River: Chadron Fm (Denson et al.)	Medicine Pole Hills (Kight)	Medicine Pole Hills (Kuhnhehn)
Grain Size (mm)	0.063-0.125	0.180-0.30	0.25-0.30
opaque (%)	78	0.37	0.43
non-opaque (%)	22	99.63	99.57
Normalized Non-Opaque HM Abundances (%) ^a			
hornblende	3	22.70	26.12
hypersthene		0.50	0.40
augite		5.53	1.73
diopside		58.77	61.56
biotite	2		
garnet (almandine)	7	4.88	3.32
garnet (gross-andr)			
epidote-clinozoisite	10	6.56	6.87
talc		0.35	
kyanite ^b	8		
andalusite ^b	6		
aluminosilicate ^b	14	0.19	
staurolite	22		
sphene	1	0.35	
apatite		0.16	
corundum			
zircon	28		
tourmaline	10		
rutile	3		
monazite			
allanite			

Figure B6 Example two-page table. Table is too large to fit on one page. (Reader please note that the illustration above is incorrect; the table should extend to the right margin.)

Table 5

Continued

	White River: Chadron Fm (Denson et al.)	Rattlesnake Butte (Nelson)	Square Butte (Fogarty)
Grain Size (mm)	0.063-0.125	0.212-0.30	0.25-0.30
opaque (%)	78	8.52	16.51
non-opaque (%)	22	91.48	83.49
Normalized Non-Opaque HM Abundances (%) ^a			
hornblende	3	0.28	1.56
hypersthene			
augite		0.65	
diopside			
biotite	2	24.16	0.32
garnet (almandine)	7	23.16	3.45
garnet (gross-andr)		1.17	
epidote-clinozoisite	10	47.12	13.48
talc			
kyanite ^b	8		
andalusite ^b	6		
aluminosilicate ^b	14	0.65	4.70
staurolite	22	0.28	10.66
sphene	1	0.52	0.94
apatite			9.72
corundum			0.32
zircon	28	0.13	1.26
tourmaline	10	0.56	3.45
rutile	3	0.75	48.27
monazite			1.88
allanite		0.56	

Note. Data given as grain percentages.

^aNon-opaque heavy mineral percentages normalized to 100%. ^bAluminosilicate is the total of kyanite and andalusite; when not differentiated the kyanite plus andalusite total is simply shown as aluminosilicate.

Figure B6 Continued.

(Reader please note that the illustration above is incorrect; the table should extend to the right margin.)

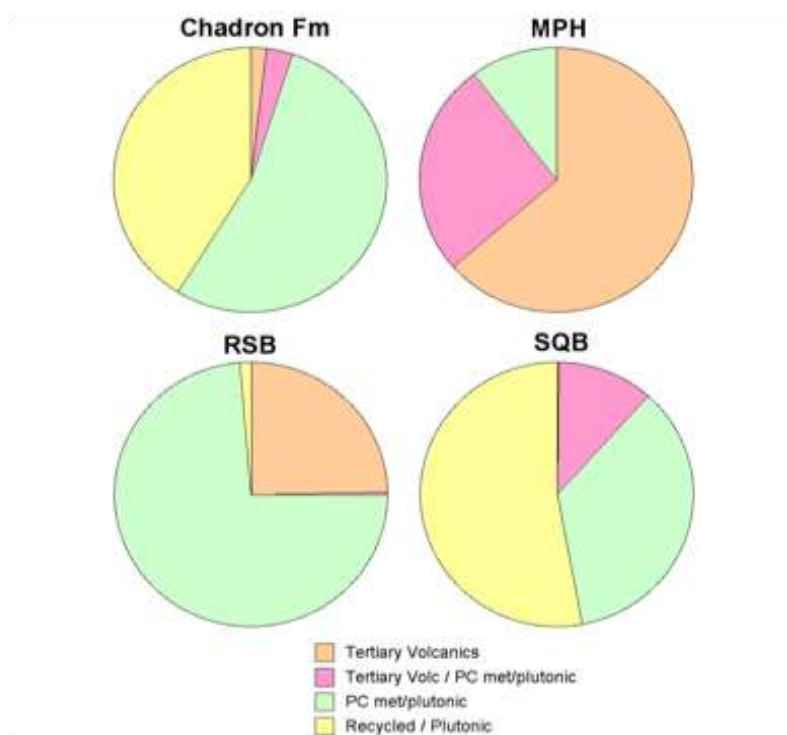


Figure 5. Comparison of Eocene sandstone sources as interpreted from heavy mineral analyses. Chadron Fm: Chadron Formation data from Denson et al. (1965); MPH: Medicine Poles Hills data from Kight (2002) and Kuhnenn (2005); RSB: Rattlesnake Butte data from Webster, reported in Nelson (2008); SQB: Square Butte data from Fogarty (2008).

39

Figure 7. Geographic and generalized stratigraphic distribution of the heavy mineral assemblage types. Locality names are shown in red. Samples in tan boxes are from Denson & Gill (1965); multiple samples are arranged according to relative stratigraphic position. Samples in blue boxes are MSU samples. Based on a base map taken from Denson et al. (1965).

Figure B8 Figure that is too large to fit the caption on the same page. The caption is centered on the page that precedes placement of the figure itself. In the List of Figures, the page of the caption is given.

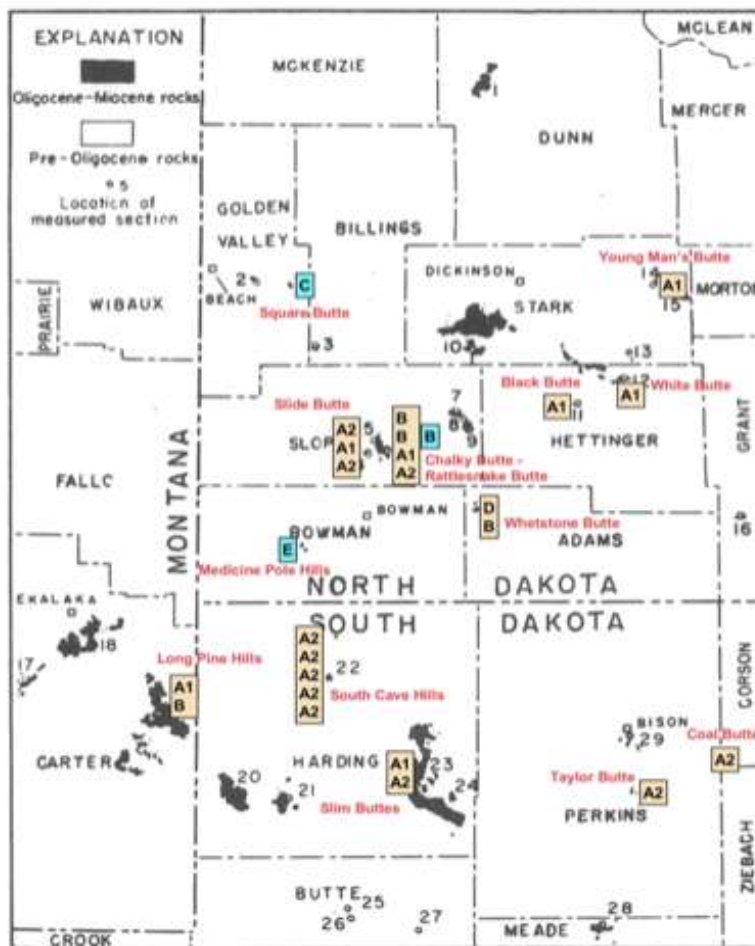


Figure B8 Continued.

References


- Arneson, C. (2005). *Lithologic comparison of sand grains of the Chadron Formation at three localities in southwestern North Dakota* (Unpublished Senior Seminar paper). Minot State University, Minot, North Dakota.
- Cool, C. (2006). *Heavy mineral analysis of sandstone using X-ray diffraction and the Rietveld method* (Unpublished Senior Seminar paper). Minot State University, Minot, North Dakota.
- Denson, N. M., & Chisholm, W. A. (1971). Summary of mineralogic and lithologic characteristics of Tertiary sedimentary rocks in the Middle Rocky Mountains and the northern Great Plains. *U.S. Geological Survey Professional Paper, 750-C, C117-C126*.
- Denson, N. M., & Gill, J. R. (1965). *Chemical, semi-quantitative, spectrographic, heavy-mineral analyses of rock and water samples and a table of selected dry holes and producing wells from the Williston basin* (USGS Open-file Report 65-40). U.S. Geological Survey.
- Denson, N. M., Gill, J. R., & Chisholm, W. A. (1965). Uranium-bearing lignite and carbonaceous shale in the southwestern part of the Williston Basin - a regional study. *U.S. Geological Survey Professional Paper, 463, 1-75*.
- Denson, N. M., Macke, D. L., & Schumann, R. R. (1990). Geologic map and distribution of heavy minerals in Tertiary and uppermost Cretaceous rocks of the Buffalo 30' x 60' Quadrangle, Johnson and Campbell Counties, Wyoming. *U.S. Geological Survey Miscellaneous Investigations Series, Map I-2022*.

Figure B9 Example References section page.

Appendix C

Example Appendices Pages

This appendix presents examples of pages from the appendices of a thesis. Full 8.5 x 11-inch pages are shown (the black border indicating the edges of the page), but are reduced to 75% of their full size so that they fit onto these pages along with captions.



Appendices

Figure C1 Example title page for Appendices that precedes appendices. This page is not paginated. If there is only one appendix, this page would be labeled “Appendix”.

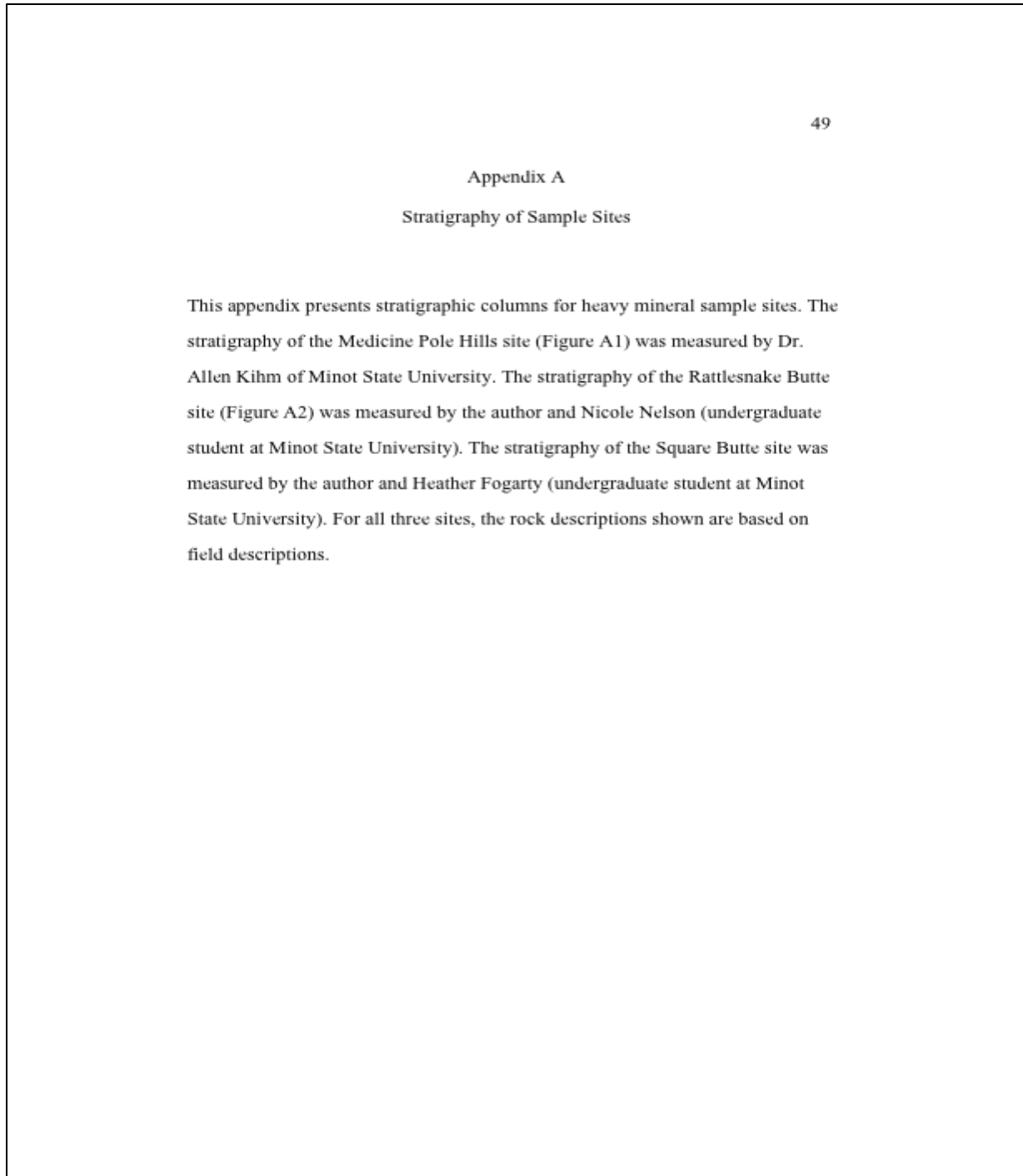


Figure C2 Example first page of an appendix. In this case, this page would be followed by pages containing the three figures that comprise the appendix. If a thesis contains only one appendix, the top line would be omitted; the top line would be the “title” of the appendix. In the Table of Contents, this appendix would be listed as “Appendix: Title of Appendix”.

Appendix D

Examples from Two Papers Option

This appendix presents examples of select pages for the “two papers” option. Full 8.5 x 11-inch pages are shown (the black border indicating the edges of the page), but are reduced to 75% of their full size so that they fit onto these pages along with captions.



Figure D1 Example main title page for the “two papers” option. This page is counted in page numbering of preface materials, but it is not paginated.

Heavy Mineral Analysis of Late Eocene Sandstone from Rattlesnake Butte

This paper was submitted by

John Seymour Rocks

Graduate Committee:

Dr. John Webster, Chairperson

Dr. Allen Kihm

Dr. Ryan Winburn

Dr. Robert Crackel

Dean of Graduate School

Dr. Linda Cresap

Figure D2 Example Approval Pages that follow the blank or copyright page.

iii

Rare-Earth Element Analysis of Geological Materials Using High-Resolution
Inductively Coupled Plasma Atomic Emission Spectroscopy

This paper was submitted by

John Seymour Rocks

Graduate Committee:

Dr. John Webster, Chairperson

Dr. Allen Kihm

Dr. Ryan Winburn

Dr. Robert Crackel

Dean of Graduate School

Dr. Linda Cresap

Figure D2 Continued.

v	
Table of Contents	
	<i>Page</i>
Abstract	iii
Acknowledgments.....	iv
List of Tables	viii
List of Figures	x
List of Plates	xii
 Heavy Mineral Analysis of Late Eocene Sandstone from Rattlesnake Butte 	
Abstract	2
Chapter 1: Introduction	3
Chapter 2: Review of Literature	7
Heavy Mineral Sources.....	7
Heavy Minerals of the Williston Basin.....	9
Heavy Minerals of the White River Group.....	13
Chapter 3: Methods.....	15
Field Work	15
Sample Preparation	15
Disaggregation and grain-size separation	16
Heavy mineral separation	17
Grain mount preparation	18
Optical Microscopy and SEM-EDS Analysis.....	20
Chapter 4: Results	22

Figure D3 Example Table of Contents for the two papers option.

	vi
Chapter 5: Discussion	25
Interpretation of Source Rocks	25
Comparison with Other Chadron Formation Studies.....	25
Significance of Heavy Mineral Comparisons	27
Implications for Correlations	27
Conclusions.....	31
Future Research	32
References.....	34
Appendix A: Stratigraphy of Sample Site	38
Appendix B: Chemical Compositions of Select Heavy Minerals.....	42
Rare-Earth Element Analysis of Geological Materials Using High-Resolution Inductively Coupled Plasma Atomic Emission Spectroscopy	
Abstract.....	48
Chapter 1: Introduction.....	49
Chapter 2: Review of Literature	52
Chapter 3: Methods.....	57
Sample Digestion and Oxalate Precipitation	57
Ion-Exchange REE Separation	64
ICP-AES Analysis	67
REE Recovery by Ca-Oxalate Precipitation and Ion-Exchange.....	71
Chapter 4: Results.....	75
Chapter 5: Discussion	86

Figure D3 Continued.

	vii
Evaluation of Ca-Oxalate Precipitation	86
Comparison with Published Analyses	89
Conclusions.....	93
References.....	94
Appendix: Analytical Wavelengths	98

Figure D3 Continued.

viii	
List of Tables	
<i>Table</i>	<i>Page</i>
Heavy Mineral Analysis of Late Eocene Sandstone from Rattlesnake Butte	
1. Non-opaque Heavy Mineral Compositions (Grain %) of Modern Sediments	10
2. Heavy Mineral Compositions (Grain %) of Tertiary Strata of the Southwestern Williston Basin Area	12
3. Non-Opaque Heavy Minerals (Grain %) of the White River Group	14
4. Heavy Mineral Composition (Grain %) of Rattlesnake Butte Sandstone	23
5. Comparison of Rattlesnake Butte Heavy Mineral Compositions (Grain %) with Other Chadron Formation Analyses.....	26
B1. Representative chemical analyses of garnet grains	43
B2. Representative chemical analyses of pyroxene grains	44
B3. Representative chemical analyses of epidote grains	45
B4. Representative chemical analyses of hornblende grains	46
Rare-Earth Element Analysis of Geological Materials Using High-Resolution Inductively Coupled Plasma Atomic Emission Spectroscopy	
1. JY-38VHR System and Operating Parameters	68
2. Spectral Wavelengths, Detection Limits, and Interferences	69

Figure D4 Example List of Tables for the two papers option.

ix

3. Compositions of Solutions Used For Oxalate Precipitation REE Recovery Procedure	72
4. Comparison of Analyses of USGS Standards BHVO-1, DNC-1, and TLM-1 With Published Values	83
5. Replicate Analyses of USGS Standards RGM-1 and SCo-1	84
A1. Comparison of Results by Analytical Wavelength	100

Figure D4 Continued.

x	
List of Figures	
<i>Figure</i>	<i>Page</i>
Heavy Mineral Analysis of Late Eocene Sandstone from Rattlesnake Butte	
1. Map of southwestern North Dakota buttes	4
2. Generalized stratigraphic column for Tertiary strata of North Dakota	5
3. Summary of the six lithogenetic Tertiary units of Denson and Chisholm (1971).....	8
4. Apparatus for recovery of heavy minerals from centrifuge bottles.....	19
5. Comparison of Eocene sandstone sources based on heavy minerals	28
A1. Stratigraphy of the Rattlesnake Butte site	39
Rare-Earth Element Analysis of Geological Materials Using High-Resolution Inductively Coupled Plasma Atomic Emission Spectroscopy	
1. Comparison of REE analysis (chondrite normalized) of an andesite with and without an oxalate precipitation	76
2. Recovery of REE and Y during oxalate precipitation	79
3. Concentrations of Ca during elution with 1.7 N HCl for samples with various initial Ca contents	81
4. Comparison of REE analyses (chondrite normalized) of standard reference materials with published values for BHVO-1, DNC-1, and TLM-1	90

Figure D5 Example List of Figures for the two papers option.

xi

5. Comparison of REE analyses (chondrite normalized) of standard reference materials with published values for RGM-1 and SCo-191

Figure D5 Continued.

List of Plates*Plate*

Heavy Mineral Analysis of Late Eocene Sandstone from Rattlesnake Butte

1. Geologic map of Rattlesnake Butte
2. Heavy mineral grain map for HM-15

Rare-Earth Element Analysis of Geological Materials Using High-Resolution
Inductively Coupled Plasma Atomic Emission Spectroscopy

no plates

Note. Plates are located in the pocket of the back cover.

Figure D6 Example List of Plates for the two papers option.

Heavy Mineral Analysis of Late Eocene Sandstones
of Southwestern North Dakota

A Paper
Submitted in Partial Fulfillment of
the Requirements for the Degree of
Masters of Arts in Teaching

John Seymour Rocks

Division of Science
College of Arts and Sciences

Graduate School
Minot State University
Minot, ND

Spring 2009

Figure D7 Example first four pages of the body of the first paper in the two papers option.

Abstract

The Chalky Buttes Member (CBM) sandstone (lower Chadron Formation) is exposed at a number of buttes in southwestern North Dakota. The Medicine Pole Hills (MPH) sandstone, exposed south of Rhame, North Dakota, has been correlated with the CBM sandstone. Heavy mineral analyses of the MPH sandstone and two samples of the CBM sandstone, collected from Rattlesnake Butte (RSB) and Square Butte (SQB) have been used to test this correlation. Heavy mineral grains were separated from fine to medium sand, mounted on glass slides, partially ground, polished, and coated with carbon. The grains were identified using optical microscopy and a scanning electron microscope – energy dispersive spectrometer (SEM-EDS) system. The analyses showed that the MPH sandstone heavy minerals were dominated by diopside and hornblende, with modest abundances of epidote-clinozoisite, augite, and almandine garnet. The two CBM sandstones yielded rather different results from the MPH sandstone, and from one another. The RSB sample was dominated by epidote-clinozoisite, biotite, and almandine garnet, with modest abundances of ilmenite and pseudobrookite. The SQB sample was dominated by rutile, with modest abundances of epidote-clinozoisite, pseudobrookite, ilmenite, staurolite, aluminosilicate (probably kyanite), apatite, and tourmaline. Results suggest that the MPH sandstone had a source quite distinct from those of the CBM samples, and should not be correlated with the CBM sandstone.

Figure D7 Continued.

Chapter 1

Introduction

Ongoing faculty-student research projects at Minot State University (MSU) have focused on the nature, age, and provenance of Eocene sandstones of southwestern North Dakota. The sandstones being studied are the Chalky Buttes Member of the Chadron Formation and the Medicine Pole Hills sandstone. The Chalky Buttes Member sandstone is exposed at a number of buttes in southwestern North Dakota (Figure 1). The Medicine Pole Hills sandstone is exposed southwest of the buttes (Figure 1). Both sandstones are conglomeratic in part. Murphy, Hoganson, and Forsman (1993) correlated the Medicine Pole Hills sandstone with the Chalky Buttes Member. This was a lithostratigraphic correlation based on the fact that both the Chalky Buttes Member and Medicine Pole Hills sandstones overlie (unconformably) various formations of the Paleocene Fort Union Group (Figure 2).

The research effort at MSU has involved a variety of studies designed to characterize and compare the Medicine Pole Hills and Chalky Buttes Member sandstones. The studies have included comparison of textures (Frederick, 2004), major mineralogy (Arneson, 2005), and pebble lithologies (Whitlow, 2003). Several studies have focused on heavy mineral analysis of the Medicine Pole Hills sandstone and the Chalky Buttes Member sandstone. Kight (2002) and Kuhnenn (2005) completed heavy mineral analyses of the Medicine Pole Hills sandstone. Hicks (2007) carried out a trace element study of diopside, the dominant heavy mineral in the Medicine Pole Hills sandstone. The goal was to determine whether

4

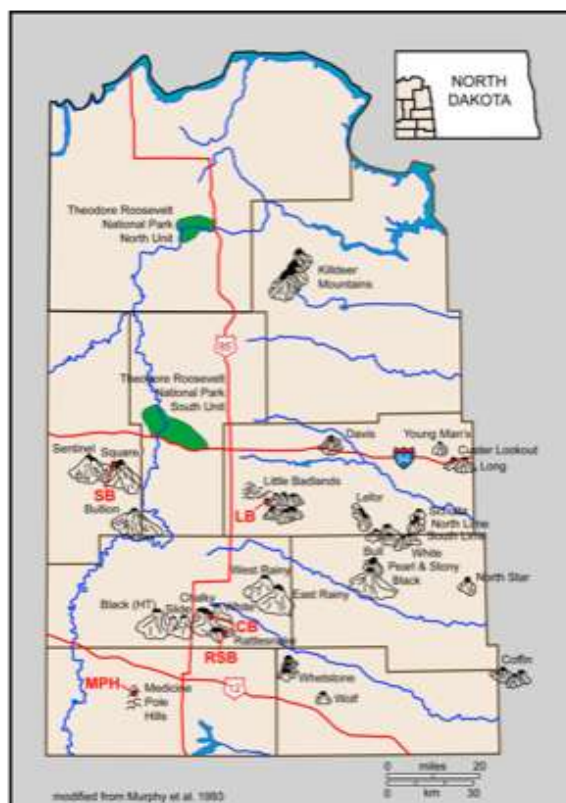


Figure 1. Map of southwestern North Dakota showing the locations of buttes that expose White River Group or Arikaree Formation strata. Red labels show locations that have been sampled for heavy mineral analysis. MPH Medicine Pole Hills, RSB Rattlesnake Butte, CB Chalky Butte, LB Little Badlands, SB Square Butte.

Figure D7 Continued.

Appendix E

Final Thesis/Major Paper Checklist

This appendix presents a checklist for review of the thesis or major paper. This form can be used by students prior to and during the writing process to help gain familiarity with APA manuscript requirements. Appropriate references to the *APA Manual* and this Manual are provided. It can also be used by students and committee members during editorial review to ensure that the manuscript requirements have been followed. Students are responsible for following the format requirements.

After the final defense, the student should make any recommended changes and submit the thesis/major paper to his/her committee chair for one final review and completion of the Final Submission Cover Sheet. The student and the chair will review and sign the cover sheet, and then it is the student's responsibility to submit one final copy along with the signed cover sheet to the Graduate School. Also, the student should email an electronic copy of the thesis/major paper to the Graduate School (tricia.vondal@minotstateu.edu). This electronic copy is used for providing quick feedback to the student. Please allow up to two weeks for the Graduate School review. Students should be aware that they may be asked to make edits based on the Final Thesis/Major Paper Checklist and submit a second copy for Graduate School review.

**MSU Graduate School
Final Thesis/Major Paper Checklist**

APA APA Manual (6th edition unless otherwise specified)

GTF Guide to Thesis Format, Fall 2010

Y/N	Requirement	Source(s) / Reference(s)
General Format		
	Margins at least 1"; 1.5" acceptable; on all sides	GTF (chapter 4, page 24) APA (section 8.03, p. 229)
	Acceptable typeface (font type and size)	GTF (chapter 4, page 28), Use Times New Roman 12 pt, Arial 12 pt, or Courier 10 pt
	Text is left-justified	Graduate School requirement (standard)
	Text is double-spaced only; exceptions are consistently applied	GTF (chapter 4, page 28) APA (section 8.03, p. 229)
	Proper format for each level of headings	GTF (chapter 4, page 27), Five levels of headings are defined by APA (section 3.03, p. 62-63)
Page numbers		
	Placed in correct location on the page (upper right)	GTF(chapter 4, pages 24+)
	Omitted from Title Page	GTF
	Omitted from first page of each chapter	GTF
	Omitted from "Appendices" heading page	GTF
	Lowercase Roman numerals for preliminary pages	GTF
	Arabic numerals used after preliminaries	GTF
General Style		
	Past tense used where required	GTF (chapter 4, page 32), APA (section 3.06, p. 65-66; section 3.18, page 78)
	Present tense used where required	APA (section 3.06, p. 65-66; section 3.18, page 78)
Conventions		
	Standard abbreviations used where required	APA (sections 4.22-4.30, p. 106-111)
	Non-standard abbreviations are defined	APA (sections 4.22-4.30, p. 106-111)
	Numbers < 10 spelled out (some exceptions)	APA (sections 4.31-4.34, p. 111-113)
	Leading zero used except where required/standard	APA (section 4.35, p. 113-114)
	Comma(s) used for numbers > 1,000 (some exceptions)	APA (section 4.37, p. 114)
	Metric units are used	APA (section 4.39, p. 114-115)
	Numbers and their unit(s) are separated by a space	APA (section 4.40, p. 115)
	Correct standard symbols used	APA (section 4.27, p. 108-109; section 4.4, p. 115; section 4.45, p. 117-123)
	Non-standard symbols are defined	APA (section 4.27, p. 108-109; section 4.40, p. 115; section 4.45, p. 117-123)

Y/N	Requirement	Source(s) / Reference(s)
	In-line equations have proper form and spacing	APA (sections 4.46-4.47, p. 118-123)
	Displayed equations referenced in text are numbered	APA (section 4.48, p. 123-124)
	Correct format used for years, dates, and times	APA (section 4.27, p. 108-109)
Preliminary Materials		
	Presented in proper order	GTF (chapter 3, page 26)
	Title Page has correct information and format	GTF (chapter 3; page 10; also Figure A1)
	Copyright or blank page inserted, not counted	GTF (chapter 3, page 2-3; also Figure A2)
	Approval Page has correct information and format	GTF (chapter 3, page 11; also Figure A3)
	Abstract Page has correct heading	GTF (chapter 3, page 11; also Figure A4)
	Abstract is single paragraph in block form	GTF (chapter 3, page 11; also Figure A4) APA (section 2.04, page 27; section 8.03, p. 229)
	Acknowledgments Page has correct heading (level-1)	GTF (chapter 3, page 13; also figure A5)
Table of Contents		
	Has correct heading	GTF (chapter 3, page 13+; also Figure A6)
	Each level of heading indented appropriately	GTF
	Page numbers right-justified	GTF
	Dotted leader connect heading with page number	GTF
List of Tables (if needed)		
	Has the correct heading	GTF (chapter 3 page 14; also Figure A7)
	Correct headings for "Table" and "Page"	GTF
	Table number and complete title shown for each table	GTF
	Each page number is right-justified	GTF
	Dotted leader connect table titles to page numbers	GTF
List of Figures (if needed)		
	Has the correct heading	GTF (chapter 3, page 14; also Figure A8)
	Correct headings for "Figure" and "Page"	GTF
	Figure number and description shown for each figure	GTF
	Each page number is right-justified	GTF
	Dotted leaders connect descriptions to page numbers	GTF

Y/N	Requirement	Source(s) / Reference(s)
List of Plates (if needed)		
	Has the correct heading	GTF (chapter 3, page 15; also Figure A9)
	Correct heading for "Plate"	GTF
	Plate number and description shown for each plate	GTF
	Each page number is right-justified	GTF
	Note following list states location of plates	GTF
Citations and References (GTF Chapter 5)		
	Citations written in proper format	APA (sections 6.11-6.21, p. 174-179; see Table 6.1, p. 177, for a concise summary of formats)
	References presented in proper order	APA (section 6.25, p. 181-183); GTF (section 3.21, p. 17-18)
	References written in proper format	APA (sections 6.27-6.32, p. 184-192; Chapter 7)
	Multi-line references use hanging indent	APA (section 2.11, p. 37); GTF (Figure B9, p. 53)
Quotations		
	Short quotations (<40 words) are in-line	APA (section 6.03, p. 170-171)
	Short quotations enclosed in double quotation marks	APA (section 6.03, p. 170-171)
	Long quotations are in block form, indented ½ inch	APA (section 6.03, p. 170-171)
	Long quotations not enclosed in quotation marks	APA (section 6.03, p. 170-171)
	Each citation for a quotation includes page number	APA (section 6.03, p. 170-171)
	Para. Number given for non-paginated sources	APA (section 6.05, p. 171-172)
	Modifications to quotations are properly noted	APA (section 6.08, p. 172-173)
Footnotes		
	Designated sequentially with Arabic numerals	APA (section 2.12, p. 37-38)
	Placed at bottom of appropriate page(s)	APA (section 2.12, p. 37-38)
	Separated from running text by short horizontal rule	Standard word-processing format
	Multi-line footnotes are double-spaced	APA (section 2.12, p. 37-38)
	Citation footnotes in proper form, with proper information	APA (section 2.12, p. 37-38)
Tables (GTF Chapter 6)		
	Properly, sequentially labeled (Table 1, Table 2, etc)	APA (section 5.05, p. 127)
	Placed properly within the thesis (after first reference)	
	Proper spacing between running text and small tables	APA (5 th edition, section 6.03, p. 325)

Y/N	Requirement	Source(s) / Reference(s)
	Large tables placed along on a page (no running text)	APA (5 th edition, section 6.03, p. 325); GTF Figure B4
	Multi-page tables placed on their own pages	APA (5 th edition, section 6/03, p. 325); GTF Figure B6
	Table titles placed correctly	APA (Table 5.1, p.129)
	Proper format for table number and title	APA (Table 5.1, p. 129)
	Multi-line table titles are single-spaced	APA (Table 5.1, p. 129); GTF Figure B5
	Line spacing within body of table is appropriate	
	Correct form and order used for table notes	APA (section 5.16, p. 138-141)
	Proper format on specific note designations	APA (section 5.16, p. 138-141)
	No vertical rules (lines) are used	APA (section 5.17, p. 141)
	Horizontal rules (lines) are used sparingly and correctly	APA (section 5.17, p. 141)
Figures (GTF Chapter 7)		
	Properly, sequentially labeled (Figure 1, Figure 2, etc.)	APA (section 5.05, p. 127)
	Placed properly within the thesis (after first reference)	
	Figures presented alone on a page (no running text)	APA (5 th edition, section 6.03, p. 325)
	Figure captions placed correctly	APA (examples, p. 152-166); GTF B7
	Proper format for figure captions	APA (examples, p. 152-166); GTF B7
	Multi-line figure captions are double-spaced	
	Text within figures is legible (not <8 pt; not >14 pt.)	APA (section 5.25, p. 161)
Plates (GTF Chapter 7)		
	Plates are appropriately, sequentially labeled	
	Placed in a pocket	
	Each plate has a caption	
	Text within plates is legible (not < 8 pt)	
Appendices		
	Placed in the order in which they are referenced	APA (section 2.13, p. 39)
	Multiple appendices: labeled in order, Appendix A, ...	APA (section 2.13, p. 39)
	Preceded by page titled "Appendices" or "Appendix"	Graduate School requirement (standard); GTF (Figure C1)
	Single appendix has a title (heading)	APA (section 2.13, p. 39)

Y/N	Requirement	Source(s) / Reference(s)
	Multiple appendices: heading includes "Appendix A"...	APA (section 2.13, p. 39)
	Tables / figures labeled as A1, A2, A3...(e.g., Table A1)	APA (section 5.05, p. 127)

Graduate School Editing Comments:

- Approved
 Approved with Minor Corrections
 Request changes, resubmit

Reviewer Initials _____ Date of Review _____

**MSU Graduate School
Final Thesis/Major Paper
Submission Cover Sheet**

Student: _____ **Date Submitted to Graduate School:** _____

Program: _____ **Type of final project:** _____

Committee Chair: _____

Student/Committee Chair: Please review the completed thesis/major paper for the following items, referring to the Final Thesis/Major Paper Checklist, Thesis/Major Paper Manual, and APA Manual as needed. Signatures at the bottom indicate you have reviewed the final document and, to the best of your ability and knowledge, state that it adheres to the requirements of the MSU Graduate School.

General Format and Structure:

_____	Margins (1" to 1.5" top, bottom, left, right; consistently)
_____	Typeface (acceptable and consistent)
_____	Text Alignment (left justified; double spaced body)
_____	Page numbers (upper right, omitted where required)
_____	Preliminary items included
	Title page
	Copyright or blank page
	Abstract (blocked, one page)
	Acknowledgments
	Table of Contents
	List of Tables, Figures, Plates (where applicable)

Text/Body of Paper

_____	Verb Tense appropriate
_____	Correct format for each level heading used
_____	Correct format on tables, figures, plates (where applicable)
_____	Correct use of citations (citations accurate and consistent with what is listed in References)
_____	References in correct format and sequence
_____	Appendices (appropriate items includes, labeled accurately)

Student Signature: _____

Committee Chair Signature: _____

*This signed document should be submitted along with one copy of the final thesis/major paper to the Graduate School. Please allow up to two weeks for the initial review.

Required beginning January 1, 2011