Structuring and Writing a Thesis
Part Two: The Abstract and Introduction

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Learning Outcomes for Part Two

By the end of this presentation, you should be able to:

- Incorporate the “Create a Research Space” (CARS) model into your proposal and thesis.
- Write a clear and well-organized abstract.
- Write a clear and well-organized introduction.
Overview of Screencast (Part Two)

1. Define and explain the Create a Research Space (CARS) model.
2. Explain how the CARS model works in an abstract.
3. Look at the parts of a model abstract.
4. Explain how the CARS model works in an introduction.
5. Look at the parts of an abbreviated model introduction.
6. Discuss what makes good research questions, objectives and hypotheses.
Creating a Research Space (CARS)

- Swales (1991) and Swales and Feak (2012) suggest that theses and research papers should create a research space.
- They developed the CARS model to help you create a research space for your research.


The CARS Model in Each of These Sections
The Moves in the “CARS” Model

1. Establish the research territory.
2. Identify a niche.
3. Occupy the niche.


Establishing the Research Territory

Establish the research territory by doing the following:

- Demonstrating that the research area is central, problematic or relevant,
- Presenting background information about the topic or problem, and
- Reviewing and synthesizing previous and current related research.


Identifying a Niche

Identify the niche for your research using one of the following strategies:

- Announcing a gap or shortcomings in the existing research or a real world problem, or
- Questioning the findings or methods of the existing research, or
- Indicating your intention to continue a research tradition.


Occupying the Niche

Occupy the niche by doing the following:

- Stating the nature and purpose of your research,
- Listing research questions and hypotheses or objectives,
- Announcing research findings,
- Stating the value of your research (optional), and
- Indicating the structure of the paper or proposal (optional).


The Abstract

- Most abstracts have a funnel shape and follow this order:
  - Establishing the research territory: the background or problem
  - Identifying the niche: the research gap or shortcomings in the existing research
  - Occupying the niche: the purpose of the research, the methods, the key findings (theses only), and the significance of the research.

- According to CGPS, the abstract should not exceed 350 words.

- Abstracts don’t have references.
Identify the CARS Moves in This Proposal Abstract

Response of High Mountain Snow and Ice Hydrology to a Changing Climate

Being sensitive to climatic conditions, cold regions in high mountains reliably indicate climate change. These changes include retreating glaciers and shrinking snow cover, which reduce the downstream water supply. Although it is known that climate change is causing glaciers to retreat, the magnitude of climate-change impacts on glaciers and streamflow is not well understood. The purpose of this research is to develop a greater understanding of the impact of climate change on mountain glaciers by applying a physically-based melt model coupled with a blowing-snow redistribution model within the Cold Regions Hydrological Model Platform (CRHM). A new glacier-melt model will be developed based on hydro-meteorological observations at Peyton Glacier in the Canadian Rocky Mountains. This model will improve knowledge of climate change impacts on downstream water resources in the Canadian Rockies. The model will apply to mountainous areas throughout the world that are facing potential water shortages and other problems due to climate change.

Courtesy of a former student
The Introduction

The introduction has a funnel shape, moving from the general to the specific by:

- Establishing the research territory: describing the background or problem and briefly reviewing the literature; this section may also introduce the theoretical framework and define terms.
- Identifying the niche: describing the gap or shortcomings in the research.
- Occupying the niche: Explaining the purpose of the research, listing the research questions, hypotheses and objectives.
Cold regions in high mountains are ... sensitive to shifts in climatic conditions and, thus, provide ... indicators of climate change (Hopkinson & Demuth, 2006; Kohler & Maselli, 2009). ... Changes in alpine snow and glacier hydrology impact the water supply ... [A] decreased water supply ... will ... impact arid and semi-arid regions. The water resources in the semi-arid Okanagan watershed in British Columbia will be unable to meet increased demand caused by population growth and projected climate change impacts (Cohen & Neale, 2006, as cited in IPCC, 2007).

Mountain snow cover is measured using glacier hydrology models. ... However, these models may not work in remote mountains, where only sparse data are available. As well, these models are likely to be unreliable for measuring future conditions because their empirical components have been calibrated on past behaviour (Poulin et al., 2011). ... For all these reasons, new models are needed to better measure snow cover and glacier melt in high mountains. ...
Identify CARS Moves (continued)

The purpose of this research is to evaluate the impacts of global climate on downstream water resources in the Canadian Rockies. The objectives of the study are as follows:

1. To develop an energy-balance hydrological model for the high mountains to study snow and glacier-melt processes.

2. To test the model using field-data archives and new measurements in the Canadian Rocky Mountains.

3. To apply the model to examine the sensitivity of high-mountain hydrology to changes in snow and ice resulting from the changing climate.

Courtesy of a former student
Research Questions, Objectives and Hypotheses

- These should be crystal clear and written in plain language.

- Number your questions, objectives and hypotheses.

- Use the same sentence structure and presentation for each question, objective or hypothesis.

- Begin with the central question, objective or hypothesis.

- Choose a logical order to present the remaining questions, objectives or hypotheses -- often in descending order of importance.
Example of Research Question and Hypothesis

1.8 Specific Aims and Goals

The specific aim of this dissertation is to investigate the relationship between aberrant plasticity and the behavioral and cognitive comorbidities associated with kindling. To address these issues, ... key questions were asked:

**Question 1:** What is the effect of amygdaloid kindling on operant fear learning and memory? ... To study this question, I conducted short- and long-term kindling of the BLA followed by amygdala- or hippocampal-dependent operant fear conditioning. ...

**Hypothesis:** [A]mygdaloid kindling will impair operant behaviors in a stimulation-dependent and task-specific manner. ... [L]ong-term amygdala kindling will produce more robust behavioral impairments than short-term amygdala kindling (Kalynchuk et al., 1997). ...

The Literature Review

- Presents the rationale for your study.
- Reveals what is and isn’t known about your topic in a synthesis.
- Exposes patterns, gaps, shortcomings, inconsistencies, and debates.
- Critiques the literature: shows how gaps or shortcomings led to your research.
- Is logically organized according to the key concepts or themes in your study.
- See the separate screencast and slides on the literature review.
Summary

- Use the CARS model to organize your abstract, introduction and lit review.
- The CARS model has three moves: establishing the research territory, identifying the niche and occupying the niche.
- Pay particular attention to the clarity of your research questions, objectives and hypotheses.
- The objectives, questions and hypotheses should be consistently presented, using the same grammatical form.