Doctoral Thesis

“. uncover new knowledge either by the discovery of new facts, the formulation of theories or the innovative reinterpretation of known data and established ideas…”

Overview of the Research Degree Process

- Application for Admission
- Enrolment
- Turnitin check of proposal
- Research Integrity training
- Application for Candidacy
- Research and Writing of Thesis
- Ethics Clearance
- Annual Progress Reports
- Submission of Thesis for Examination
- International Sponsored Students Reports
- Graduation
Where to find the Candidacy form

- Download the Application for Candidacy form here.

Candidacy: The first big hurdle

- What is it?
  - Description of your research – what, how, why
  - Sets your research into wider context of the discipline
  - Identifies the gap/need for further work
  - Shows how you will approach the problem
Candidacy: The first big hurdle

"Piled Higher and Deeper" by Jorge Cham
www.phdcomics.com

The Research Process: What

- Questions to ask:
  - What interests me?
  - Within this area, what questions do I want to find answers to?
  - What is known about this area?
  - Where are the gaps in our knowledge/understanding?
  - Will this research have significance?

- Develop the research question
  - Discuss ideas with supervisor(s)
  - Define the goals/aims/outcomes
  - Understand significance
Really Important Questions

1. Is the research topic of sufficient interest to sustain you through the whole of thesis enrolment?
2. Is the research "do-able", that is, can it be conducted and managed by you?
3. Will the research be worthwhile and make a contribution to knowledge in the field?
4. Will you be able to obtain data and protect the confidentiality of the data sources?

The Research Process: How

- Developing a plan takes time……
  - What will you need to know to answer the research question?
  - How can you find this out?
  - Methodology: qualitative, quantitative
  - How will the data be collected?
- Resources
  - How much time will you need?
  - What equipment and facilities will be used?
  - Collaboration?
  - Budget?
And what about…….

- **Animal research** – does your research involve animals
  - Appropriate training
  - Understanding legislation

- **Ethics and confidentiality** – does your research involve people
  - Do you need ethics approval?
  - Can you get enough data
  - How will you keep it confidential

- **Health and Safety** - are you working with the following
  - Biological agents
  - DNA
  - Radiation safety
  - Hazardous substances
  - Then you must submit a [Hazard Identification Tool (HIT)](HIT)

Requirements for candidacy

- Completion of the Research Integrity training (on Blackboard)
- Masters - 5 page proposal
- Doctoral - 10 page proposal
- Presentation of research plan (most areas)
- Budget
- Timelines
- Risks
- Turnitin report (via Research Integrity)
Who will be involved in your candidature?

- Supervisor
- Co-supervisor
- Associate Supervisor
- Chair of Thesis Committee
- Postgraduate Coordinator
- Head of School
- Graduate Research School GSOs

Role of the Supervisor

- Direct you to up-to-date developments on your topic and to people with expertise in your field
- Offer advice and assistance to you about the topic and the outcomes of your research
- Assist you with formulating the research question
- Assist you with drawing up any budget estimate for the proposed research
Role of the Supervisor

- Assist you with preparing a timetable for completing candidacy requirements.
- Advise about ethics clearance and intellectual property.
- Read and respond constructively to drafts of your summary of proposed research program.

Research Integrity Training

- Research Integrity Training:
  - Developed by Epigeum in collaboration with Australian Universities
  - Access for students through Blackboard
  - **Compulsory for all HDR students and staff involved in research**
  - HDR students must complete BEFORE candidacy submitted.
  - Work with your supervisor if you find this difficult
  - Includes Turnitin link to submit the Candidacy proposal
Summary of Proposed Research Program

- What goes where?
  - Abstract
  - Objectives
  - Background
    - Review of Literature
  - Significance
  - Research Method
  - Ethical Issues
  - Facilities and Resources
  - Data Storage
  - Timeline
  - References
Objectives, Background, Significance

- Objectives: Outline the research problem and what question you will be answering
- Background: The literature review provide an overview of the what’s known and where your question fits
- Significance: Shows the impact your research will have on the field, answers the “so what?” question

The abstract

- Motivation
- Problem statement
- Approach
- Expected outcomes
- Keep it simple, keep it short
- Avoid use of jargon or highly technical language
Abstract

Example of an Abstract MPhil
Title: The delivery of quality nursing care: A grounded theory study of the nurses’ perspective

The purpose of this study is to explore and describe the delivery of quality nursing care from the perspective of practicing nurses working in the acute public hospital setting of Western Australia (WA). The study will examine the actions and interactions attributed to quality, and factors identified as enhancing or inhibiting the delivery of quality nursing care. A grounded theory approach is proposed. The sample for the study will be drawn from nurses working in an acute public hospital located in Perth, WA. Data will be collected using semi-structured interviews and some observation. It is estimated that approximately 10-15 interviews will be performed. Theoretical sampling will guide the selection of participants. The significance of this research will be to increase understanding of this complex phenomenon and contribute to efforts aimed at improving and maintaining quality nursing care within the current context of the WA health care system. A substantive theory explaining the process of quality care, focusing on the nurses’ perspective, in an acute public hospital setting, will be developed. Implications for practice will be discussed and directions for further research in this area will be provided.

Heat Transfer Enhancement and Fluid Flow Characteristics Associate With Jet Impingement Cooling

With the increasing miniaturization of Micro-Electro-Mechanical Systems (MEMS) heat dissipation is rapidly becoming a problem to further development in micro-electronics industries. Jet impingement cooling has often been identified as a method with the potential to provide the high rates of heat transfer needed for rapid head removal. To this end an in-depth numerical study of jet impingement will be performed to quantify the heat transfer enhancement in a useful manner. The numerical study will be carried out using the commercial finite volume computational fluid dynamics software FLUENT. Experiments will be performed to verify the results obtained from simulation.

Based on an extensive review of published work in addition to preliminary studies carried out during the period of provisional candidature, the results from this research are expected to show significant benefit in using jet impingement cooling in MEMS applications. These results (both experimental and numerical) will additionally be used to develop a correlation between the heat transfer and other relevant parameters of the jet. An accurate correlation of this nature will be a significant contribution to the field as it will allow jet impingement cooling to be more effectively applied to a wider range of industrial problems.
Getting the background

- What is a literature review?
  - Survey of existing published research in your area
  - Provides context – the big picture
  - Establishes need
  - Shows who else is working in this area

- Targeted reading
  - Project must be focused so read strategically
  - Read proactively – make notes
  - Evaluate critically
  - Look for different points of view

Significance

Example of a Significance Statement

The study is significant for four reasons. First, it is likely to provide new information about students’ construction of science in the period of transition between primary and secondary school. It is likely to lead to a greater understanding of when and why attitudes to subject and career choices are formed, and hence contribute to more equitable subject choices in science in post-compulsory education. Second, it will have implications for teaching practice by highlighting strategies that are both gender inclusive and more likely to result in improved student attitudes to science. The third are to which the study is likely to contribute is in developing transition programs in science, including those in the middle schools recently created in Western Australia. Finally, the research method used in the study is focused on gaining detailed qualitative data about a small number of students but against a background of more general quantitative information from surveys of a larger group. The combination of quantitative and qualitative methods is designed so that the small sample selected is typical of the larger group, and that the fine-grained data necessary to examine the changes in perceptions and attitudes during the transition from primary to secondary schooling can be collected in context.
Significance

Example of a Significance Statement

Title: Structural Geology and gold Mineralisation of the Ora Banda Zulieka District, eastern Goldfields Western Australia

The key outcome of this research is the documentation of regular structural geometry at macro to micro scale and the interpretation of the distribution of strain throughout the Ora Banda structural domain. An important aspect is the interpretation of the late faults in the Kalgoorlie District as structures that cross-cut the regional ductile shear zones and are not produced as lower order structures off the larger shear zones. A regular structural system has been recognised from interpretation of aeromagnetic data and the distribution of these structures is coincident with the distribution of gold deposits, so the documentation of these relationships is central to the study. The results of this study will also be of more regional significance to the structural interpretation of the greenstone sequence in the Ora Banda Domain, as studies at the Enterprise mine will allow late fault events to be separated into a more detailed sequence of deformation pulses. Correlation of geological structure and gold deposition will have a particular significance of future gold exploration in the Eastern goldfields.

What to put in the Ethical Issues section

- You must indicate that you are aware of, and have taken steps to account for, ethical issues relating to data collection and reporting in your research project.
- Australian Code for the Responsible Conduct of Research
- National Statement on Ethical Conduct in Human Research
- Australian Code of Practice for the Care and Use of Animals for Scientific Purposes
- Visit Curtin’s Research ethics and integrity webpage
What to put in the Ethical Issues section

- Researchers have responsibility to do the following things and you should ensure all those relevant to your study are addressed. For Human ethics:
  - Give Information
  - Get Permission
  - Ensure Privacy and Confidentiality
  - Show Consideration
  - Give Acknowledgment

Example of an Ethics Statement

Title: A Longitudinal Study to Students’ Perceptions about Science during Transition from Primary to Secondary School.

Students, their parents and teachers will be involved in providing potentially sensitive information for this study. Written permission notes will be obtained from the people concerned, as well as from the principals and heads of departments as appropriate, to collect the necessary data. Because the students will be only eleven or twelve years old when they are initially approached, interviews with them will be completed in the presence of their parents whenever possible. This practice has the advantage of keeping the parents informed, and it also means that the interviews will be done out of school time, causing as little disruption to both students and teachers. The students, and parents will receive feedback as the research progresses. When the study is completed, altering the names of the people and schools will protect confidentiality.
Ethics Training - Humans

- **Human Research:**
  - *InfoEd training: Online Human Research Ethics &*
  - For ethics contacts visit [http://research.curtin.edu.au/about/contact/](http://research.curtin.edu.au/about/contact/) and search ‘Research Integrity’

Ethics Training - Animals

- **Animal Research training**
  - *Animal Welfare training Module 1 – Successful completion of this training is a prerequisite to using animals in teaching & research at the university*
  - Presenter: Dr Beng Hooi Chua, Animal Facility Manager
  - Covers the principles for ethical research involving animals at Curtin
  - Includes information about the functions of Animal Ethics Committee, relevant regulations and acts, application process & case studies
Facilities and Resources (1)

Examples of Facilities and Resources Statements

Title: Tectonic Setting and Tectonomorphic Evolution of Fuping-Wutai-Hengshan Orogenic Belt, China

Facilities for this analytical work are available at Curtin University and cooperative units around Western Australia. These include the SHRIMP2 mass spectrometer at Curtin University, thin-section grinding equipment and resource microscopes for petrographical analysis, electron-microprobe and SEM instruments (arrangement with UWA) for mineralogical composition analysis, computers for processing analytical data, etc. Ar/Ar analysis will be done at Australian National University.

Facilities and Resources (2)

Examples of Facilities and Resources Statements

Title: A Longitudinal Study of Students’ Perceptions about Science during Transition from Primary to Secondary School.

No special resources or facilities are required to complete the study.
Time Schedule

<table>
<thead>
<tr>
<th>No</th>
<th>Research Activities</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Review and develop literature review</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>2</td>
<td>Develop research methodology &amp; write proposal</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Organise ethic approval &amp; develop data collection sheet</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Inform the potential participants for observational study &amp; collect data for observational study</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>5</td>
<td>Collect data from snapshot review</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Assess clinical significance of interventions by panel</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>7</td>
<td>Develop interview guide and questions</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Undertake interview pilot testing &amp; in-depth interview</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Undertake data analysis, write &amp; publish the thesis</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

Budget

Consumables and travel allowance:
- $2,000 per year (lab based),
- $1,400 per year (non-lab based)
- All doctoral: $2,500 conference allowance

http://research.curtin.edu.au/postgraduate-research/current-research-students/student-forms/
GRS Webpage – Current students

http://research.curtin.edu.au/postgraduate/current-students/

Candidacy Web Page
Timeline for the Candidacy Application

- Expected Timeline
  - 6 months FTE for doctoral degrees
  - 3 months FTE for master's degrees
  - Apply for extension if late
  - Check for possible plagiarism via HDR Turnitin, accessed through the Research Integrity training on Blackboard (next slide)
  - Discuss report with your supervisor

Suggested Timeframe for Candidacy

<table>
<thead>
<tr>
<th>WHAT</th>
<th>HOW</th>
<th>TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conceptualise research</td>
<td>Literature review Thinking Analyzing Reflecting Consulting with others eg. supervisor</td>
<td>1/2 - 2/3 of time</td>
</tr>
<tr>
<td>design</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commence writing</td>
<td>Start placing ideas together in writing</td>
<td>Ongoing</td>
</tr>
<tr>
<td>Advanced liaison</td>
<td>Early contact with organisations and people anticipated to be involved in the research</td>
<td>Ongoing</td>
</tr>
</tbody>
</table>
### Suggested Timeframe (cont’d)

<table>
<thead>
<tr>
<th>WHAT</th>
<th>HOW</th>
<th>TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prepare a first draft of summary of the proposed research program</td>
<td>Objectives, Significance, Research methods, Ethical issues</td>
<td>1/4 - 1/6 of time</td>
</tr>
<tr>
<td>Prepare a final draft of summary of the proposed research program</td>
<td>Include refined material, add Timeline, Abstract, Title, References, Budget</td>
<td>1/4 - 1/6 of time</td>
</tr>
<tr>
<td>Complete Application for Candidacy Form</td>
<td>Ensure Part A is completed and signed</td>
<td></td>
</tr>
</tbody>
</table>

### Project planning - Resources

#### Time

!["Piled Higher and Deeper" by Jorge Cham](https://www.phdcomics.com)

"Piled Higher and Deeper" by Jorge Cham

www.phdcomics.com
Project planning - Resources

- **Time**
  - Develop good time management skills and habits
  - Make time for writing, research and for life outside work!
  - Turn off email while writing
  - How much time can you spend on research?
  - How much do you need for your project

Timeline for Thesis

- **Expected Timeline**
  - Aim for 3 years doctoral, 2 years masters
  - Prepare carefully
  - Have contingency plans

- **The Golden Rules:**
  - Write early, write often
  - Don’t get it right – get it written
The form

Web and Email Contacts for GRS

- [http://postgraduateresearch.curtin.edu.au/about/contact-us/](http://postgraduateresearch.curtin.edu.au/about/contact-us/)
- Current Student enquiries (including Candidacy)  
  [GRS.CurrentStudents@curtin.edu.au](mailto:GRS.CurrentStudents@curtin.edu.au)
- Thesis examination enquiries  
  [thesis@curtin.edu.au](mailto:thesis@curtin.edu.au)
- Training and Seminars enquiries  
  [GRS.Training@curtin.edu.au](mailto:GRS.Training@curtin.edu.au)
- Postgraduate Research Scholarships enquiries  
  [Research_scholarships@curtin.edu.au](mailto:Research_scholarships@curtin.edu.au)
Location of Graduate Research School

- Visit us: