The University Of Queensland
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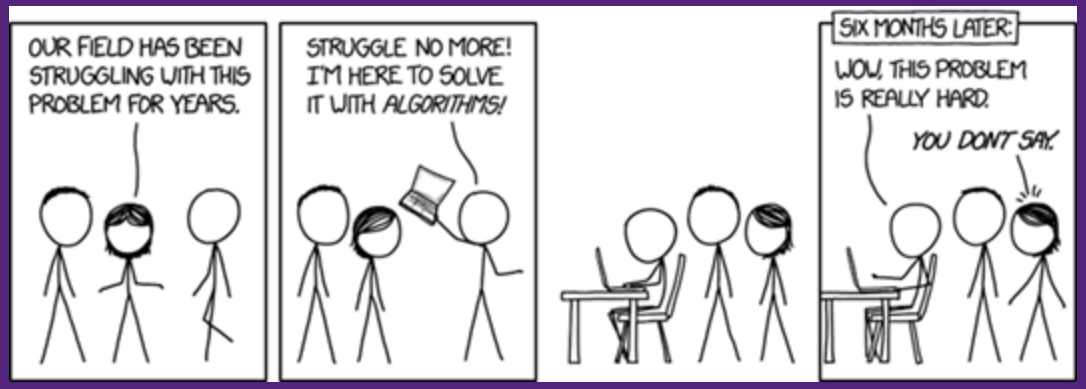
CREATE CHANGE

REIT6811 | Research Methods

Lecture 1: Introduction to Research Methods

Dr Alina Bialkowski



xkcd.com/1831

Acknowledgement of Country

We acknowledge First Nations people as the original inhabitants and the Traditional Owners of the land on which this course was developed. This land is Meeanjin (Mee-an-jin), also known as Brisbane. We pay deep respects to all Elders past, present and emerging on this land and the lands from which we are presenting.

The Brisbane River pattern from *A Guidance Through Time* by Casey Coolwell and Kyra Mancktelow.

Part 1
Introduction to REIT6811
Preliminary notes

Overview of course

- Course purpose: introduction to research and project work
  - Course Description: *Research methodology and research tools for computer science & engineering. Theoretical and practical material for starting, supporting and advancing research project work*.
- Recommended for master's students in first semester at UQ
  - Can be taken as a companion to first semester of a 2-semester project
    - REIT7841 [Semester 1] or REIT7842 [Semester 2] https://eecs.uq.edu.au/current-students/thesis-coursework-information/
- Webpage/Blackboard: https://learn.uq.edu.au
- Course Profile: http://www.uq.edu.au/study/course.html?course_code=REIT6811

Course Staff – Coordinator & Lecturers

Dr Alina Bialkowski
Course coordinator

Interests: machine learning, computer vision, artificial intelligence

Dr Lei Guo

Interests: microwave medical imaging, MRI, deep learning

Prof Janet Wiles

Interests: human centred computing, cognitive science, artificial intelligence

Dr Karl Bertling

Interests: lasers, photonics, terahertz

Contact email: reit6811@eecs.uq.edu.au

Tutors

- Mr Achintha Abayasiri
- Ms Chen Chen
- Ms Gwyneth De Guia
- Ms Vijaya Sarmishtha Kaza
- Ms Sarah Khalife
- Ms Yidi Lu
- Ms Loren Yee Hang Ong
- Mr Yash Pandey
- Mr Ke (Marshall) Xu

Embedded Language Support for REIT6811

- Embedded Language Support Officer: Stuart Crosbie
- *eaitelso@uq.edu.au*

- Scan the QR code to add to your contacts

General Structure for S1 2025

- Lectures are in-person (recordings via ECHO 360 on Blackboard)
- Slides available from Blackboard
- Course is offered in single mode:
  - Internal delivery: tutorials are on campus
- Participation in tutorials is critical and is assessed
- There are 2x assignments
- End-of-semester exam

Draft schedule: See the Blackboard site for updated schedule

REIT6811 Schedule

S1 2025	Week	Week starts	Lecture No	Lecture Topic	Tutorial No	Tutorials	Assignment deadlines
February	Week 1	24/02/2025	1	Overview	--	No tutorials in week 1	
	Week 2	3/03/2025	2	Research and Academic Integrity	1	Academic Integrity	
March	Week 3	10/03/2025	3	Literature Review & Referencing	2	Referencing Software	
	Week 4	17/03/2025	4	Research Quality & Metrics	3	Research Quality	
	Week 5	24/03/2025	5	Proposals & Methodology	4	Human Ethics	
April	Week 6	31/03/2025	6	Data #1	5	Data Analysis - Mxed Methods	
	Week 7	7/04/2025	7	Data #2	6	Data Handling in Research	Asgt1 due Monday of Week 7
	Week 8 + Good Friday (Fri)	14/04/2025	8	Research with Humans		No tutorials due to Friday Public Holiday	
	Mid-semester break	21/04/2025					
May	Week 9	28/04/2025	9	Presentations	7	Pitching and Storytelling	
	Week 10 + Labour Day (Mon)	5/05/2025	10	Conferences and Thesis Writing	8	Explainers	
	Week 11	12/05/2025	11	Intellectual Property	9	Intellectual Property	Asgt 2A slides due Monday Week 12, 4pm
	Week 12	19/05/2025	12	Critical analysis of research methods	10	Course review presentations	Oral presentations for Asgt 2A are in tutorials
	Week 13	26/05/2025	13	Exam preparation and Q&A	11	Course review presentations	Asgt 2B written component due Friday Week 13, 4pm
June	*Revision Week*	2/06/2025					
	Exam Week 1	9/06/2025					End of Semester Exam in the exam period
	Exam Week 2	16/06/2025					

Access to Course Material

- All lectures will be available on Blackboard
  - Lecture material
    - We will aim to make sure that the material has all the relevant information needed in written form, even if you've not heard the lecture.
  - AV recordings of lectures
    - But these can sometimes be too big to download

Weekly Contact Sessions

- Tutorials extend concepts introduced in lectures
- Interactive and assessed
- Bring your laptop to lectures and tutorials!

Time	Mon	Tue	Wed	Thu	Fri
8:00				T04	T08 & T09
9:00					
10:00					
11:00					
12:00			L01		T05
13:00					
14:00			T01 & T02	T10	T06
15:00					T11
16:00			T03	T07	
17:00					

Communications about the Course

- Announcements on Blackboard (BB) will automatically be sent to your UQ email address https://learn.uq.edu.au
- Ed Discussion board (accessible via BB) https://edstem.org/au/courses/21521/discussion
- Course email account reit6811@eecs.uq.edu.au
- Opportunity to ask questions via Ed Discussion Board during the week; questions will be answered on Ed Discussion Board or in the lecture
- On campus – questions can be asked after the lecture (2pm Wednesday) or through an appointment
- Tutorials: Ask questions to tutors and participate in discussions

Email protocols in REIT6811 #5

Alina Bialkowski STAFF
Now in General

PIN STAR WATCHING 1 VIEW

Professional communication is an important part of research. It is important for this course, and also when you approach lecturers about thesis projects or other research opportunities.

In REIT6811, we will predominantly use this Ed Discussion board for communication to enable faster response times and provides a consistent message to all students without repetition, however for more personal or complicated matters please email reit6811@eecs.uq.edu.au

Emails should:

- Include a meaningful description in the "Subject" line and in this course should start with REIT6811 in the "Subject" line. e.g.
  - Subject : *REIT6811 - Absent from tutorial this week*
- Start with a greeting
  - i.e. "Dear Alina, ... " (Lei, Janet, Karl, Chen, Marshall, Vijaya, Yash, Gwyneth, Loren, Yidi, Sarah, Achintha)
  - When in doubt, use: Dear Professor <surname>
  - For this course, you can use our first names
- Be respectful and professional (check your grammar and spelling before you send it)
- End with your full name and student number
- Be sent from your official UQ student address

Comment Edit Delete Endorse •••

There was an exam question on professional emails last year – you may have to write one in the exam.

Emailing staff – helpful tips

- If you would like to email a lecturer or tutor or your supervisor, please do the following
  - Send email from your UQ student account
  - Send it to reit6811@eecs.uq.edu.au
  - Include the course code in the Subject: line, e.g. "REIT6811 – question about deliverable"
    - This helps the recipient find your email amongst the 100s of emails they may receive each day!
- Address lecturer/tutor using one of the following styles, depending on how well you know them ☺
  - "Dear Professor <last name>"
  - "Dear Dr <last name>"
  - "Hi <first name>"
- Sign the email with your full name and student number.

Assessment

Category	Assessment task	Weight	Due date
Participation/ Student contribution	Active participation in tutorial activities Hurdle Identity Verified In-person	30%	3/03/2025 - 30/05/2025 Participation material is due at the end of your scheduled contact session.
Paper/ Report/ Annotation, Essay/ Critique	Assignment 1 Hurdle	20%	7/04/2025 4:00 pm
Presentation, Portfolio, Reflection	Assignment 2 Hurdle Identity Verified In-person	20%	Assignment 2A. Slides are due on Monday of Week 12 (submission via Blackboard). 19/05/2025 4:00 pm Students give their oral presentations in their regular tutorial time in weeks 12 or 13. 19/05/2025 Assignment 2B. The written report will be based on the journal notes from the lectures (journals are via Blackboard). 30/05/2025 4:00 pm Students give their oral presentations in their regular tutorial time in weeks 12 or 13.
Examination	End of Semester Exam Identity Verified In-person	30%	End of Semester Exam Period 7/06/2025 - 21/06/2025

Passing this course (1)

- A 2-unit (#2) course at UQ should be ~10 hours work per week
  - This includes lectures, tutorials and assignments
- Attend the weekly lectures and complete the lecture journal activities
  - Most lectures have 2-3 journal activities
  - Lecture journal activities need to be completed by Friday each week
  - They will be assessed as part of Assignment 2 (part B)
- Attend the weekly tutorials and participate well (30%)
  - Starts in Week 2
  - Tutorial activities due at the end of your tutorial
  - Best 8 out of 10 weekly tutorial activities
  - Last 2 weeks of semester are for Assignment 2 Presentations
- Criteria & Marking
  - Marks will be given for active and engaged participation. Participation will be assessed on the regularity of contribution, quality of ideas based on the learning materials for the week, and quality of feedback in response to others' ideas. Simply attending tutorials is not enough.
- You must get at least 50% in tutorial participation to pass course

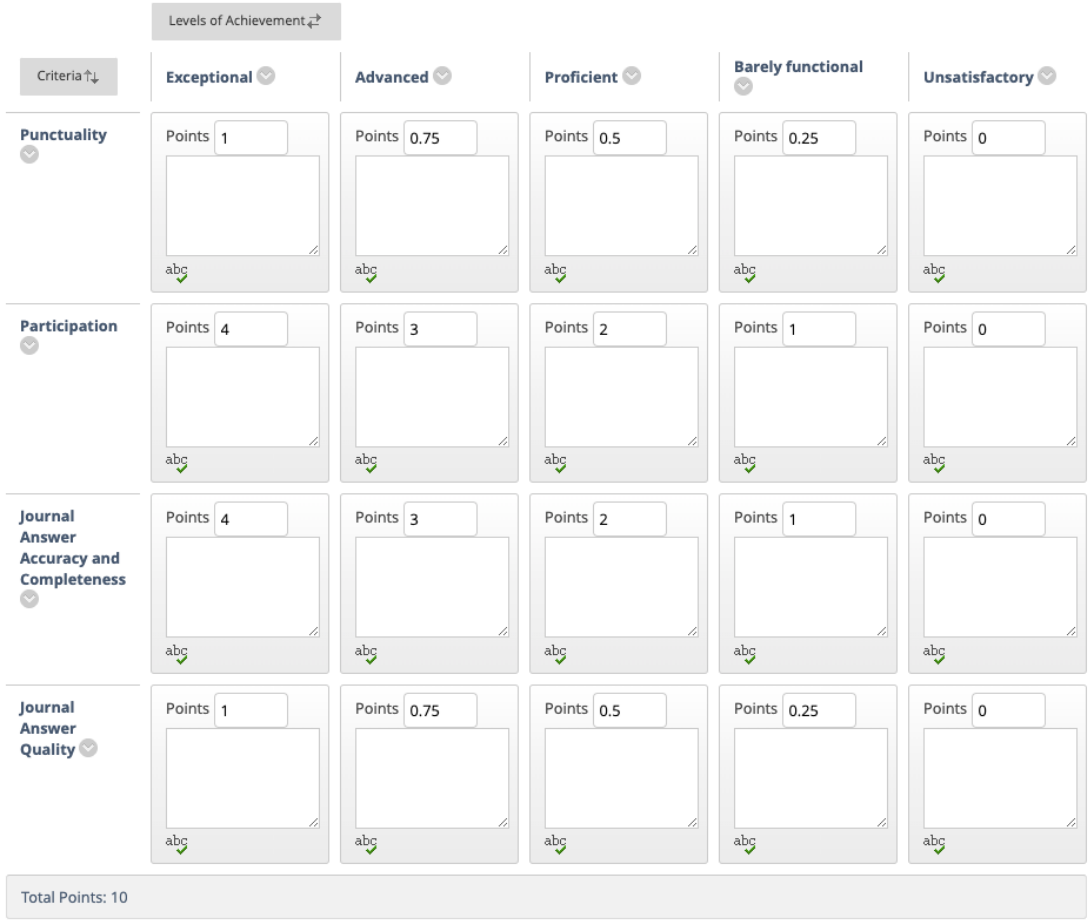
Passing this course (1)

Active participation in tutorial activities

Hurdle | Identity Verified | In-person

Mode	Activity/ Performance
Category	Participation/ Student contribution
Weight	30%
Due date	3/03/2025 - 30/05/2025
	Participation material is due at the end of your scheduled contact session.
Other conditions	Time limited. See the conditions definitions
Learning outcomes	L01, L02, L03, L04, L05, L06

- Assessment items for tutorial sessions received after the end of the contact session will receive a zero mark.
- No extensions available and 100% late penalty applied.
- To accommodate unforeseen circumstances such as illness, your score for the "participation in tutorial activities" will be based on the best 8 out of 10 tutorials.



Passing this course (2)

- Submit both assignments for assessment (40%)

- Must get at least 50% total over all assignments to pass course

Part A Presentation
Slides due 4pm, Monday of **Week 12**
Presentations in **Week 12 & 13** tutorials

Part B Report based on lecture journals
Due 4pm, Friday of **Week 13**

Assignment 1

Hurdle

Mode	Written
Category	Paper/ Report/ Annotation, Essay/ Critique
Weight	20%
Due date	7/04/2025 4:00 pm
Learning outcomes	L01, L02, L03, L04

Assignment 2

Hurdle Identity Verified In-person

Mode	Oral, Written
Category	Presentation, Portfolio, Reflection
Weight	20%
Due date	Assignment 2A. Slides are due on Monday of Week 12 (submission via Blackboard). 19/05/2025 4:00 pm Students give their oral presentations in their regular tutorial time in weeks 12 or 13. 19/05/2025 Assignment 2B. The written report will be based on the journal notes from the lectures (journals are via Blackboard). 30/05/2025 4:00 pm Students give their oral presentations in their regular tutorial time in weeks 12 or 13.
Other conditions	Time limited. See the conditions definitions
Learning outcomes	L01, L02, L03, L04, L05, L06

Exam

End of Semester Exam

Identity Verified In-person

Mode	Written
Category	Examination
Weight	30%
Due date	End of Semester Exam Period 7/06/2025 - 21/06/2025
Other conditions	Time limited. See the conditions definitions
Learning outcomes	L01, L02, L03, L04, L05

Assessment dates

- **Active participation in Weekly Contact Activities** (30%)
  - **Weeks 2-13** inclusive
- **Assignment 1** (20%)
  - 4pm, Monday **Week 7**
- **Assignment 2** (20%)
  - Part A Presentation
    - Slides due 4pm, Monday of **Week 12**
    - Presentations in Week 12 & 13 tutorials
  - Part B Report based on lecture journals
    - Due 4pm, Friday of **Week 13**
- **Exam** (30%)
  - In exam weeks in June

Resources for your individual thesis project

- REIT6811 doesn't help you find a thesis project
  - Talk to the coordinator of your thesis code
- The EECS project/thesis course home page and Thesis Ed Discussion Board
- Your supervisor
- Other students in your supervisor's group
- UQ Library runs useful research-related sessions
  - Orientation to the library and its resources
  - How to use databases and other library tools (including the librarians!) to find high-quality papers in your topic area
  - How to use referencing software so that you can cite papers using a standardised professional style.

When it's time to submit assignments for REIT6811

- On every submission put:
  - Your name and your student number
- One file per submission
  - One file only, even for deliverables that might involve timelines, charts, diagrams, etc.
  - Submit your deliverable via Turnitin AND Gradescope via Blackboard links.
- Assignment 2 presentations in week 12 and 13 are due to be uploaded at the beginning of Week 12
- For each Lecture and Tutorial, journals need to be maintained
  - Lecture journals are due Friday each week
  - Tutorial journals are due by the end of your tutorial each week

Journals

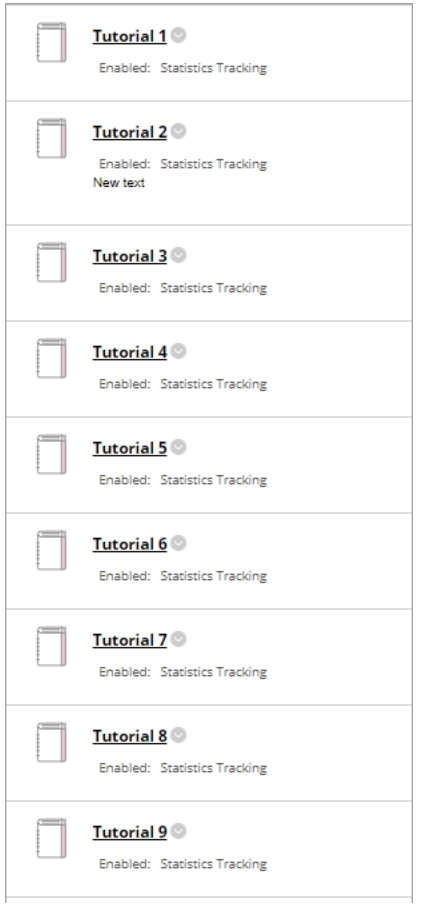
- Journals are a collaborative tool that can create greater interaction between you and the teaching staff. A journal entry can include links to resources, multimedia as well as text.

- Journals can be used to reflect on learning experiences or activities.

- Unlike a blog, journals can only be viewed and commented on by teaching staff, not by other students in the course.

Journals in REIT6811

- One journal set for every week
- Set to become available on the tut day
- Weekly posts – only ONE per week
- Allowed to change/edit or delete
- Will be marked with a rubric



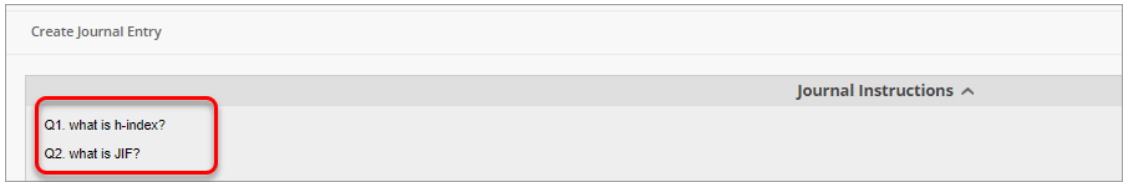
Journals Q&A

Q: Where do I submit?

A: In Assessment, go to the current week's tutorial and click on Create Journal Entry

Q: What do I write about?

A: Answer the question under Journal Instructions.



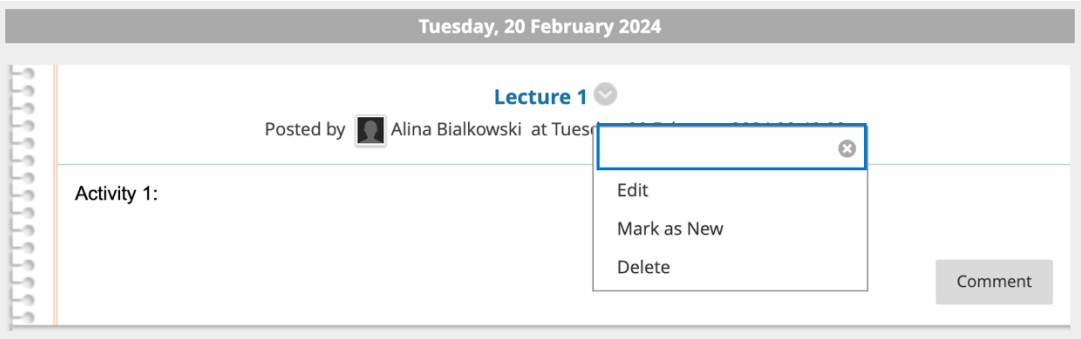
Q: Can I attach a file (pdf or Word etc.)?

A: Yes, click on Browse local files when you are creating an entry.

Journals Q&A

Q: I made a mistake, can I resubmit?

A: No, you can edit your post: In Assessment, go to the current week's tutorial, click on the down arrow next to your entry > Edit



Q: Can I submit 2 entries per week?

A: No, just 1. You can add a comment to your entry.

Q: Who can see my posts?

A: Only you and the course staff (tutors, lecturers)

Q: Where can I see my results?

A: In MyGrades.

Journal Activity

- **Activity 1:**

  "Write a brief description about yourself, the degree you are doing, and how Research Methods could be helpful to you"

- Open Blackboard
- Go to Learning Resources > Lecture Journals > Create a New Entry
- Name it "Lecture 1"
- Write down your response to Activity 1 (10 min)

Generative AI in REIT6811

- **Tutorials:** This assessment task is to be completed in-person. The use of generative Artificial Intelligence (AI) or Machine Translation (MT) tools will not be permitted. Any attempted use of AI or MT may constitute student misconduct under the Student Code of Conduct.
- **Assignments:** Artificial Intelligence (AI) and Machine Translation (MT) are emerging tools that may support students in completing this assessment task. Students may appropriately use AI and/or MT in completing this assessment task. Students must clearly reference any use of AI or MT in each instance. A failure to reference generative AI or MT use may constitute student misconduct under the Student Code of Conduct.

- Note that Generative AI:
  - You will learn better by attempting tasks yourself first!
  - May hallucinate or fabricate information
  - May have reasoning errors
  - May have knowledge cut-offs e.g. September 2021
  - Does not cite its sources, be careful of plagiarism
  - Careful of Intellectual Property leakage

Citing Generative AI

Cite and describe how the AI was used:

https://guides.library.uq.edu.au/referencing/chatgpt-and-generative-ai-tools

- "EMI Instrumentation Presentation" prompt; initial slide outline for presentation on EMI shielding in MRI ChatGPT, Apr 2023 version, OpenAI, 2 Feb. 2024, chatgpt.com
- If referencing specific text, do not copy the generated material – just like a journal article or textbook you should write the generated material in your own words, unless quoting (which you should always do sparingly)

Appendix A:

Please use the following Table A1 and statement to acknowledge your use of generative AI in this assignment. Include this table at the end of your report or slides, near your references section. The first two rows (in orange) are example only, and should be removed before use.

I acknowledge the use of generative AI tools in completing this assignment. Details of which tools were used and how they were used are provided in the table below, along with appropriate in-text and full references. I take responsibility for critically evaluating and integrating the AI-generated content, and ensuring it adheres to academic integrity standards.

AI Model Used and date	**Table A1. Generative AI usage** (tick all that apply)								
	Language Translation	Grammer/Style	Planning/Drafting	Research/ Background Information	Content Creation text	Content Creation visual	Content Creation code	Feedback	Other (provide details)
ChatGTP 4o 11/09/24		✓	✓	✓				✓	
Midjourney 11/09/24						✓			

Main messages

- Keep up to date with lectures – reading through lecture slides, listening to recordings
- Participate in tutorials
- Get in contact with your project/thesis supervisor so that you are getting input and help from them
- If you have a project or thesis, do deliverables when relevant for your project, as your project unfolds
- Ask questions to instructor and tutors

Part 2
Introduction to REIT6811
Themes and Topics

How does research differ from learning a new topic?

- Discuss this question with the person next to you.

Research vs Learning a New Topic

	Research	Learning a New Topic
Purpose	Aims to generate new knowledge, test hypotheses, or solve specific problems.	Focuses on understanding existing knowledge and acquiring skills.
Approach	Involves systematic investigation, data collection, and analysis.	Involves studying established materials like books, lectures, or tutorials.
Outcome	Produces new insights, theories, or solutions.	Leads to personal understanding and skill development.
Sources	Uses primary sources like experiments, surveys, or case studies.	Uses secondary sources like textbooks, online courses, and expert explanations.
Process	Requires critical thinking, questioning, and often peer review.	Involves absorbing information, practicing, and reviewing.

Example:

Research: Conducting an experiment to test how sleep affects memory retention.

Learning: Reading about sleep cycles and memory formation in a psychology textbook.

While learning is about *absorbing* knowledge, research is about *questioning and expanding* it.

Source: ChatGPT Prompt "How does research differ from learning a new topic?" OpenAI. (2024). *ChatGPT-4* [Large language model]. https://openai.com. Accessed 26/02/2025

What are research methods?

- Domain-specific research practices for a specific area
  - Theories used
  - Methods and technologies used
  - Analysis methods
  - Style of writing up results
- Generic research skills
  - Project planning
  - Reading, literature reviews
  - Writing
  - Seminars, posters, demos
  - Time management

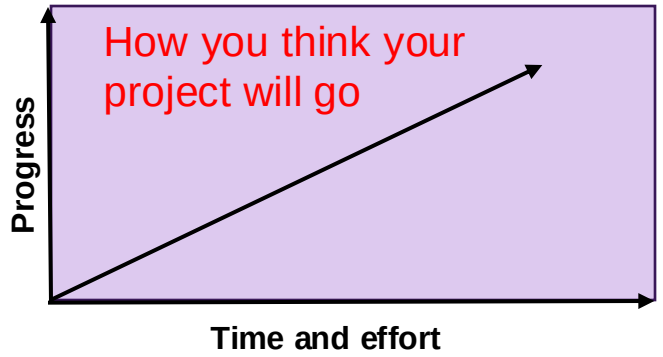
"There are as many scientific methods as there are individual scientists"

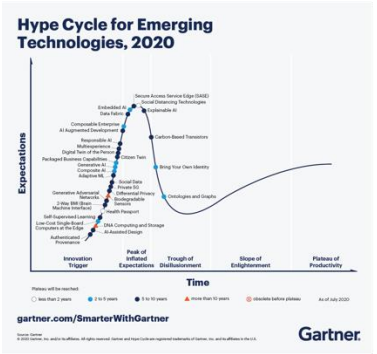
Percy W. Bridgeman,

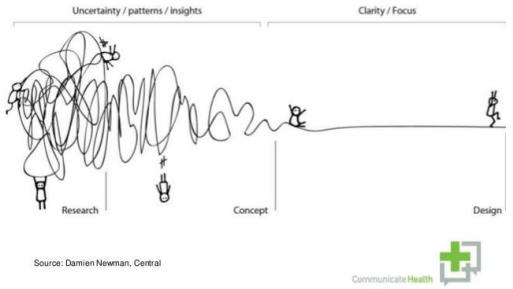
On Scientific Method

Goals of REIT6811

- The goal of REIT6811 is to give you ideas and tools that will help you understand research and help your project/thesis
- Projects and theses are a different style of activity from traditional engineering and computing courses.
- You will be pursuing original ideas!
  - Things never go as smoothly as you hope
  - There are ups and downs
  - Your thesis/project gives you experience in succeeding, despite the ups and downs.

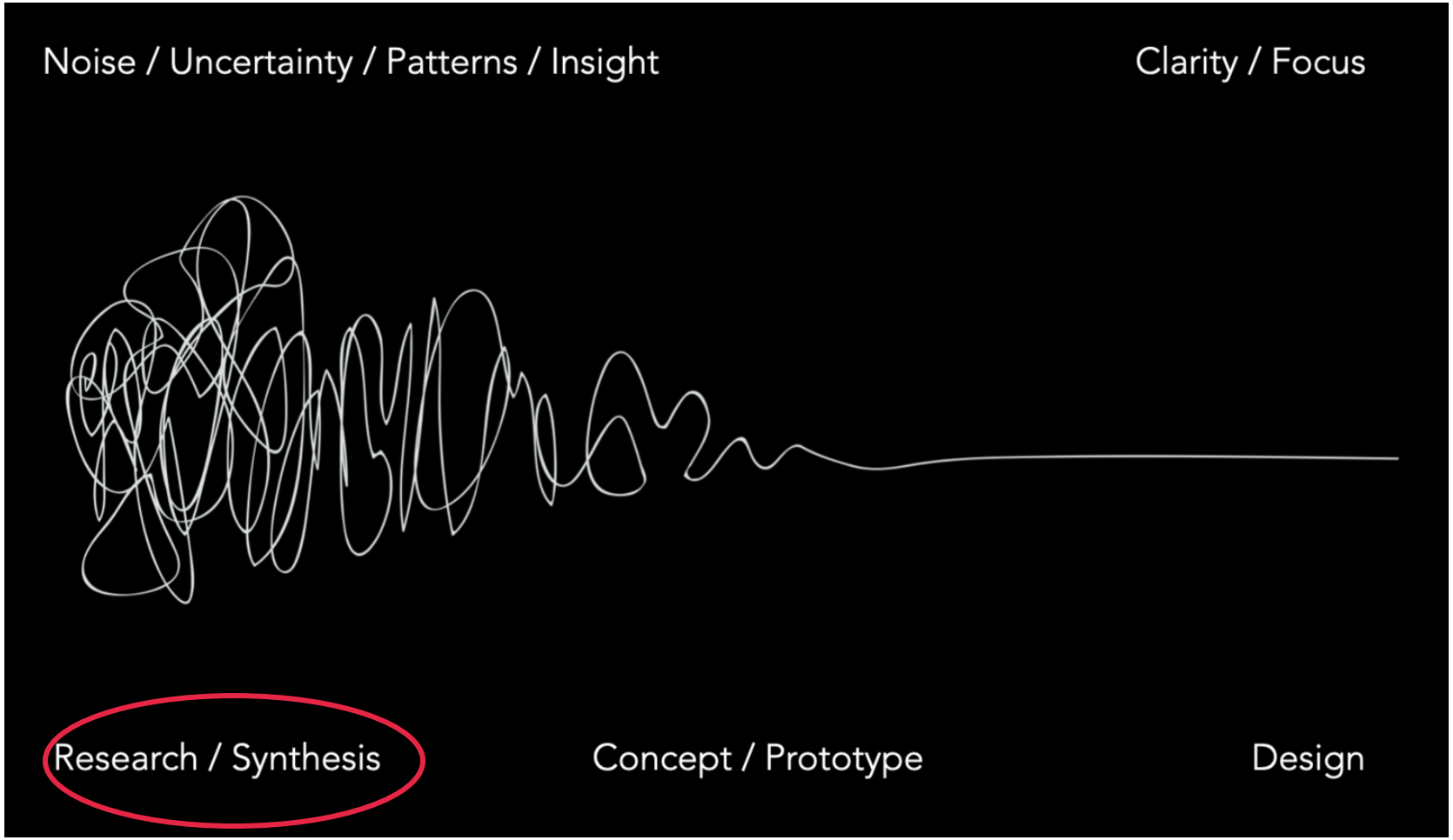






How projects usually progress

Damien Newman's Design Squiggle



The Process of Design Squiggle by Damien Newman, thedesignsquiggle.com

Hype Cycle for Emerging Technologies

https://www.gartner.com/en/research/methodologies/gartner-hype-cycle

How do Hype Cycles work?

"Each Hype Cycle drills down into the **five key phases** of a technology's life cycle.

1. **Innovation Trigger:** A potential technology breakthrough kicks things off. Early proof-of-concept stories and media interest trigger significant publicity. Often no usable products exist and commercial viability is unproven.
2. **Peak of Inflated Expectations:** Early publicity produces a number of success stories — often accompanied by scores of failures. Some companies take action; many do not.
3. **Trough of Disillusionment:** Interest wanes as experiments and implementations fail to deliver. Producers of the technology shake out or fail. Investments continue only if the surviving providers improve their products to the satisfaction of early adopters.
4. **Slope of Enlightenment:** More instances of how the technology can benefit the enterprise start to crystallize and become more widely understood. Second- and third-generation products appear from technology providers. More enterprises fund pilots; conservative companies remain cautious.
5. **Plateau of Productivity:** Mainstream adoption starts to take off. Criteria for assessing provider viability are more clearly defined. The technology's broad market applicability and relevance are clearly paying off."

https://www.gartner.com/en/research/methodologies/gartner-hype-cycle

What *is* research?

- It doesn't have a simple definition
- It's not common sense, but instead "uncommon" sense!
- You will be choosing a research project and will be learning how to do research.
- How do you do an excellent research project?
  - Learn to do research well by doing it under guidance of a knowledgeable supervisor (apprenticeship model)
  - Learn to focus your attention and activities effectively.
  - Use a checklist to challenge yourself along the way (see research checklist that follows).

Journal Activity

- **Activity 2:**

  “What is the difference between studying an undergraduate course where the material is already established and known, and conducting research?”

- Open Blackboard
- Go to Learning Resources > Lecture Journals
- Under Lecture 1, make sure you edit the entry
- Write down your response to Activity 2 (10 min)

Hints on how to answer a broad question which has no obviously correct answer

- Given a broad question like “What is the difference between studying an undergraduate course where the material is already established and known, and conducting research?”, you can break it into logical parts: For example, start with a sentence on the parts that you know, and then compare them:

  - Describe the characteristics of a course where material is already established
  - Describe or define the characteristics of research
  - Explain the difference

"A Research Checklist" [1]

1. Are the project/thesis **ideas** clear and consistent?
2. Is the **problem** worthy of investigation?
3. Does the project have appropriate **scope**?
4. What are the specific **research questions**?
5. Is there a **hypothesis**?
6. What would disprove the hypothesis? Does it have any improbable consequences?
7. Are the premises (assumptions) sensible?
8. Have the **ideas and approach** been **critically reviewed**? Have you satisfied yourself that it is sound science?

Quoted from Zobel, J. (2004) *Writing for Computer Science*, Springer Verlag. Pp. 182-183

"A Research Checklist" [2]

9. How are the **outcomes** of your research to be **evaluated**? Why are the chosen methods of evaluation appropriate or reasonable?
10. Are you working in a **team**? Are the roles of the research team members clear? What are your responsibilities?
11. What activities will others undertake?
12. What are the likely **weaknesses** in your research outcomes?
13. Is there a written **research plan**?
14. What forms of **evidence** or **data** are you going to use?

Quoted from Zobel, J. (2004) *Writing for Computer Science*, Springer Verlag. Pp. 182-183

"A Research Checklist" [3]

15. Have **milestones**, timelines, deadlines been identified for your project, so you know if you are making adequate progress?
16. Do the **deadlines** leave enough room for your advisor to provide feedback on your drafts, or for your colleagues to contribute to the material?
17. Has the **literature** been explored in appropriate depth? Once the work is largely done – and your perspective has changed – does the literature need to be explored again?

Quoted from Zobel, J. (2004) *Writing for Computer Science*, Springer Verlag. Pp. 182-183

Learning how to do research by doing it

Some important things to learn and achieve

- Knowing the ground rules for *integrity and honesty* in research (online academic integrity tutorial)
- Doing *background research* (preparing an annotated bibliography and literature review)
- Finding and defining a *topic* and presenting it in a proposal
- Presenting a *seminar* on your research progress
- Demonstrating your work in a *poster*
- Completing a final project *report*

What do *you need to do* for excellent research?

- The **grading sheets** for the thesis/project courses will tell you what an excellent thesis project is.
  - But they don't tell you exactly what you need to do to produce an excellent project.
- What you do, and how you do it, is up to you
  - You need to work out for yourself what your skills are in each of the areas required to do the project.
  - You need to create a plan that will enable you to work towards an excellent piece of work.
- One way to do create such a plan is to turn the mark sheet into a personal action checklist:
  - For each item, consider what actions need to be taken, and consider if you have the skills already, or need to develop them.

Other topics covered in REIT6811 lectures

- Communication
  - Reading the literature
  - Writing reports
  - Oral communication – in person and conversations (tutorials, in lectures)
  - Written communication (informal) – Ed Discussion questions, email exchanges
  - Written communication (formal) – journals, assignments, final report
- Foundations of effective literature
- Research integrity and ethics
- Intellectual Property (IP)
- Entrepreneurship opportunities at UQ

Journal Activity – Ice Breaker

- **Activity 3**: Meet 3 new people you haven't met before; Try to broaden your criteria

"What are their names, their field of study and your understanding of why they wanted to take the course?"

- Open Blackboard
- Go to Learning Resources > Lecture Journals
- Under Lecture 1, make sure you edit the entry
- Write down your response to Lecture 1: Activity 3 (10 min)

For next week

- Sign up to a tutorial contact session
- Double check room
- Ensure you are on time