



UNIVERSITY OF
AUCKLAND
Waipapa Taumata Rau
NEW ZEALAND

Advanced Software Engineering Development Methods

SOFTENG 701 – Theme 2: Educational Literature and Design

Educational Theory

Theme 2: Education in Software Engineering

Learning outcomes for this lecture:

- Discuss ideas and concepts for the group project.
 - Analyse how to write a useful literature review.
 - Review the Software Development Lifecycle.
 - Understand how educational theory fits into the SDLC.
-
- Understand different educational theories and how to **apply** them within a software engineering context. (Capabilities 1, 2)
 - **Synthesise** educational literature and present findings in a report. (Capabilities 1, 2, 5, 6)

Group Project

You have assignments to complete as a group:

- Literature Review
- Development project

You will be developing an educational tool that is supported by the educational theory you have learnt in this course. The tool does not have to be in a Software Engineering context. We will learn more about this on Friday.

You may want to cater your literature review to your group project. For example: Suppose you are designing an application to teach the concept of linked lists, you could focus on educational theory that has been used to teach linked lists

Literature Reviews

- **Let's discuss different approaches to a literature review**
 - **Literature Search / Background**
 - **Literature Review**
 - **Systematic Literature Review**

Literature Reviews

The draw-a-scientist test (DAST) introduced by Chambers [72], and inspired by Goodenough's Draw-A-Man test [73], and later Draw-A-Person [67], is well regarded in this domain. The intention of this approach was to identify when children form distinctive images of scientists, what influenced these images and if they identify social and psychological attitudes. This has been repeated in a variety of contexts. Martin specifically targeted computer scientists [74], with similar works applying this to computer science [75, 76] or utilising a Draw-a-Computer-Scientist test (DACST) [77]. Engineers are also a common target of this approach, Knight and Cunningham designed a Draw-an-Engineer Test (DAET) [78], the results of which can be influenced by implementing an intervention with students [79].

Literature Reviews



What is missing from the excerpt that we have just looked at?

Literature Reviews

Synthesis of the literature. In the previous example, we have listed these relevant papers and shown there is relevant background research in this area. However, there is no discussion, analysis or synthesis of the outputs of each paper.

We need to clarify the main points of each paper (succinctly) and discuss how their outputs relate. This will help to identify the current state of the literature. This can then be used to justify our research intent — either by utilising the findings of these papers or identifying a research gap that we are intending to fill.

Literature Reviews

The notable difference between these contexts are the focus of the stereotypes.

The scientist and computer scientist disciplines placed more emphasis on personal stereotypes such as gender, age and culture, with less focus on the work involved [4, 7, 8, 20, 24]. While this existed in draw-an-engineer research, it was primarily focused on the stereotypes regarding the *work* that was performed by engineers — whether children thought they fulfilled the roles of fixers, builders and mechanics [79,84].

- Perhaps your research is focused analysing these differences between approaches
- Or you may be interested in personal stereotypes and investigating how to replicate the results of the draw-a-scientist based studies.

Systematic Literature Reviews

- A **systematic** approach to a literature review.
 - An intentional and purposeful selection of data, following a predefined method.
1. Define your information sources e.g. databases searched.
 2. Define your search terms.
 3. Define your inclusion criteria.
 - Type of report/evidence
 - Date
 - Many other types of criteria dependent on study

Systematic Literature Reviews

- A **systematic** approach to a literature review.
- An intentional and purposeful selection of data, following a predefined method.

This style of literature review allows for a quantitative analysis of the state of the research on a particular topic. This is useful for identifying trends, including research gaps.

A systematic literature review is often a novel piece of research, significant enough to justify its own publication.

Useful Databases in our domain

As a student at the University of Auckland, you have access to a wealth of existing research through our Library. You can access the online portal at <https://www.auckland.ac.nz/en/library.html>

There are a variety of databases you can search, some recommendations for the Software and Education domains:

- ACM Digital Library (Association for Computing Machinery)
- IEEE Xplore (Institute of Electrical and Electronics Engineers)
- ERIC (Education Resources Information Center)

Google Scholar is also an option for diverse searches, make sure to use the University proxy!

Tips for Your Literature Review

Use Overleaf for your group work. If you are concerned about using LaTeX, this is also a useful tool for simplifying the process. This is an important skill to learn if you are going into an academic pathway.

Define your terms. This issue is not unique to education/SE/CS, there are varying definitions for terms in literature. Definitions change, or can be established by different authors, it is important to define the terms you use (supported by references) before you discuss them.

Begin with a **broad search**. Complete a 'literature search' first. Record papers of interest and include a brief synopsis of the paper. Categorise them, or include keywords, to assist with synthesising similar areas of research.

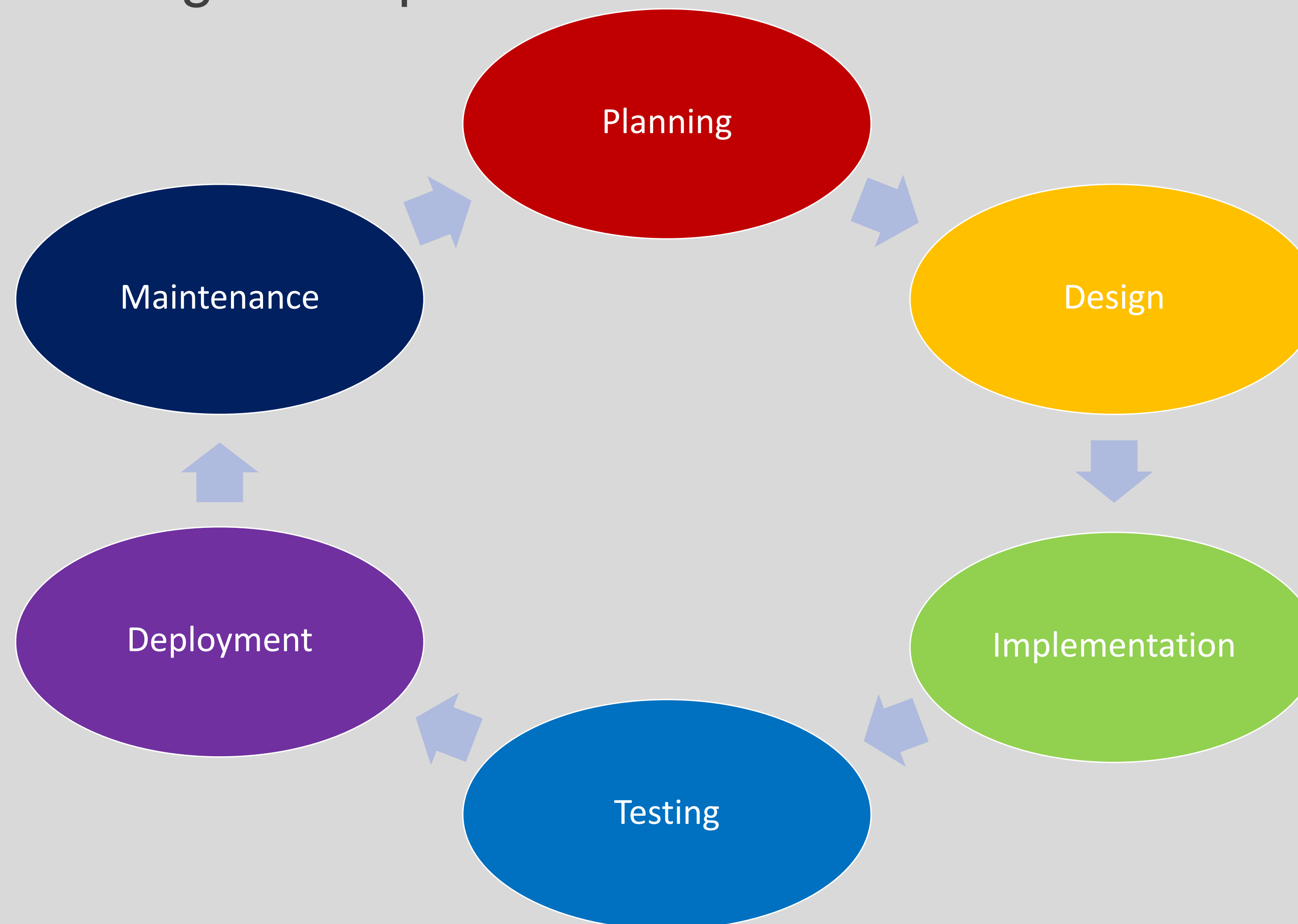
Tips for Your Literature Review

Define an overall **purpose or theme** for your review. This could be related to your project. If not, choose something general but cohesive. For example, you could be reviewing common educational theory/ methods/practices used in mobile application design. This is just a suggestion — try to think of unique and interesting approaches that will relate to your group work.

Find **interesting** links between your papers. Perhaps it's a common trend, or even disagreements in findings. Find these interesting links (preferably related to the overall purpose of your review) and highlight them.

Software Development LifeCycle

The Software Development Lifecycle (SDLC) is a process commonly follow to produce a software artifact. There are variations of this, and different implementations of the model, but most will follow this general process:

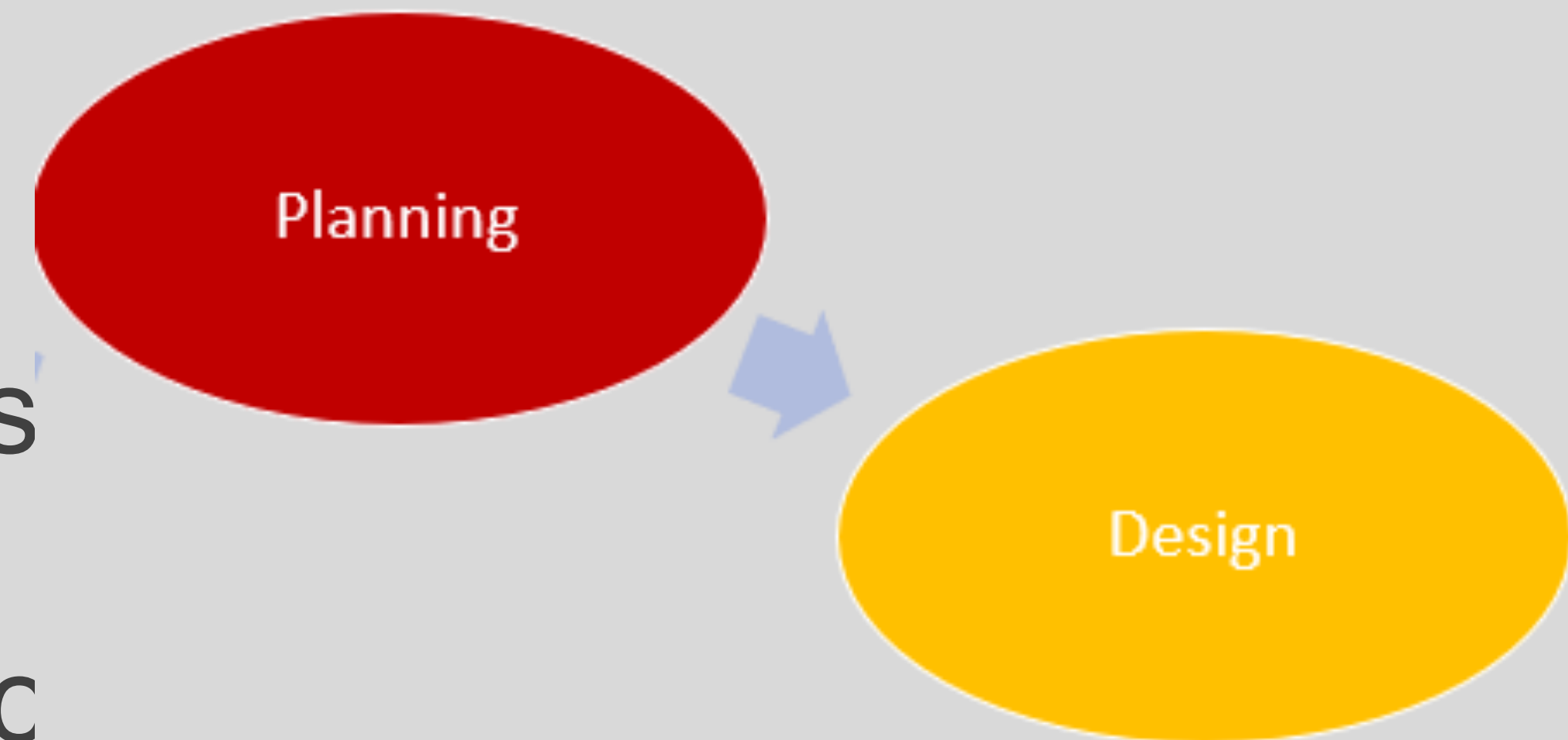


Software Development LifeCycle

You will typically apply your educational theory knowledge in the planning and design phase.

Planning

- Requirements Analysis
- Understanding your stakeholders
- Identifying learning outcomes
- Reviewing existing educational tc
- Preparing a curriculum approach



Software Development Lifecycle

You will typically apply your educational theory knowledge in the planning and design phase.

Design

- Technology stack
- Educational design
- Task design
- Iterative process

