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Writing a **State of the Art** section

Outline

- What is a **State of the Art** section?
- What skills do I need?
- Where do I start?
- Writing
  - What should I write about?
  - Structure
  - Writing style

Introduction to State of the Art

1. What are they?
2. Why do we need them?
3. What skills are involved?

What is a State of the Art section?

“Background reading is a select analysis of existing research which is relevant to your topic, showing how it relates to **your** investigation or project. It **explains** and **justifies** how your investigation may help answer some of the questions or **gaps** in this area of research.”

(University of Reading, n.d.)

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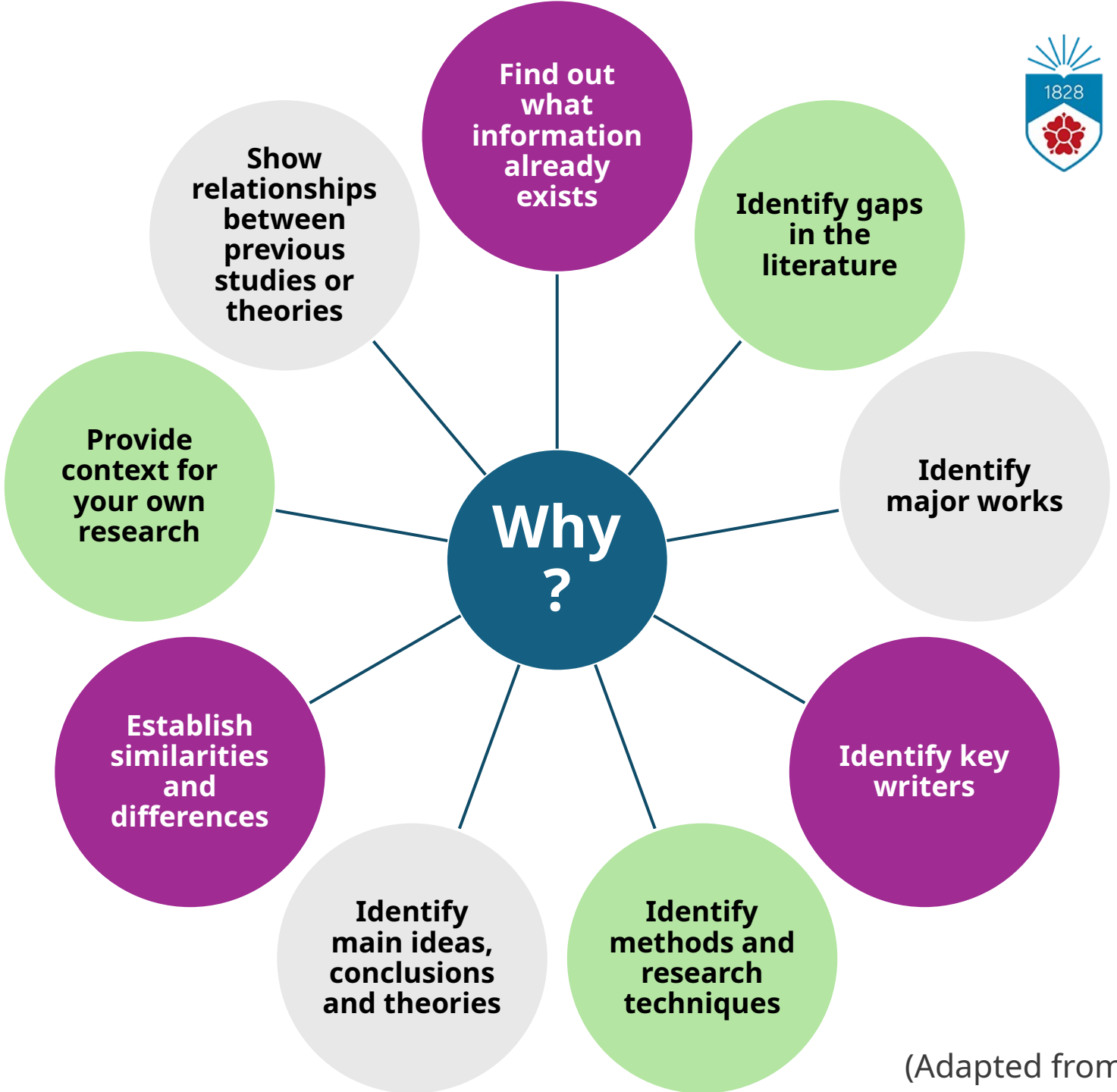

(Adapted from Lincoln University, n.d.)

From a PhD session …

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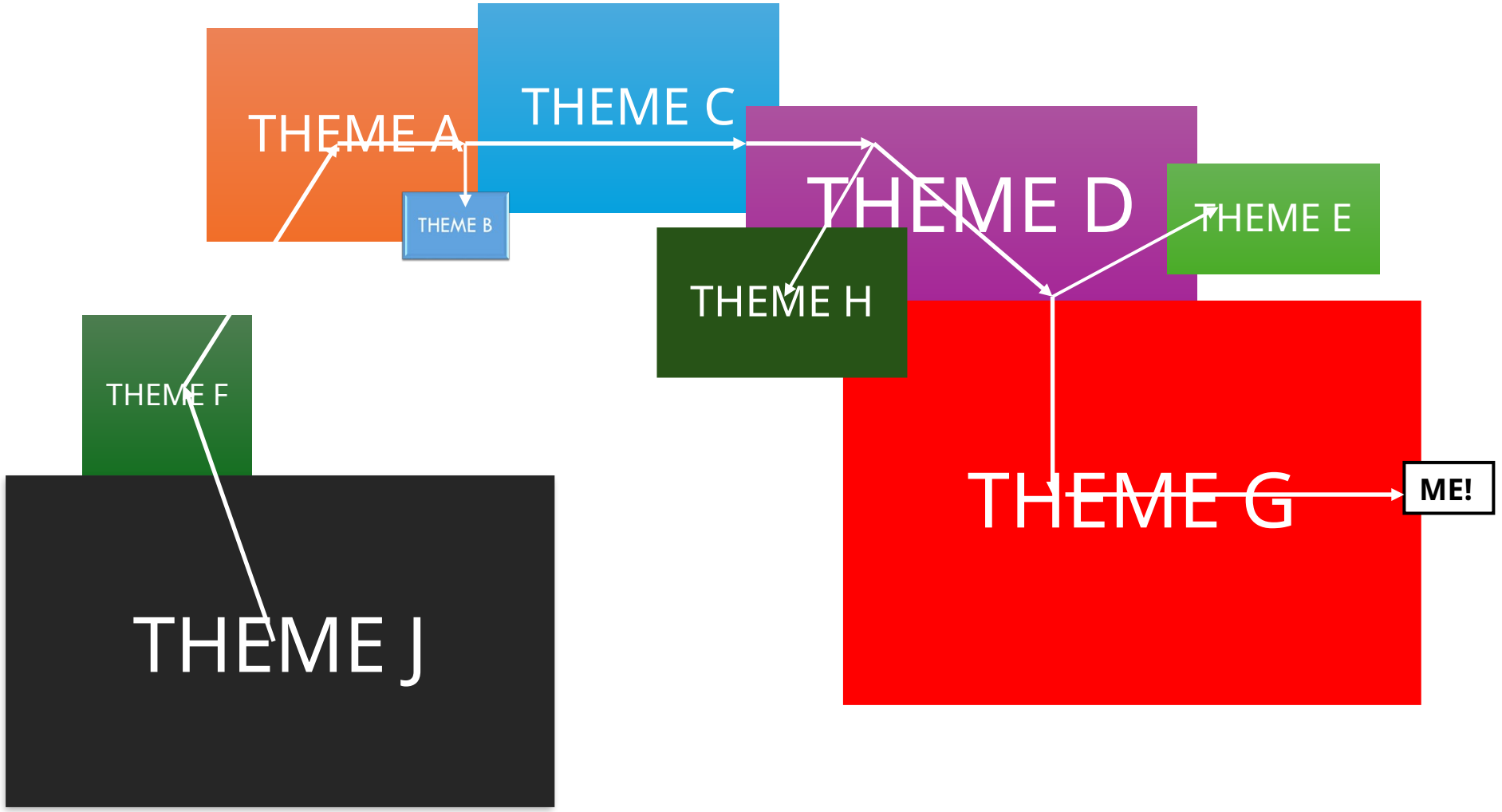

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Why have one?

- It helps define and limit your research area
- It puts your study in context/perspective
- It helps avoid unnecessary duplication
- You can evaluate promising research methods
- You can relate your findings to the Ste of the Art section.

Preparation

What skills do I need to use?

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Before writing

Information searching
Locate sources, subject journals and reading lists.
Make your own reading list.

Source evaluation
Is it reliable, relevant and up-to-date?

Reading skills
Scanning, skimming and critical reading

Note taking
Organised, memorable, structured

Planning and organisation
Structure ideas for the writing stage

During writing

Referencing
Check your school's requirements

Academic style
Clear, concise and explicit

Paragraph structure
One theme/focus per paragraph

Spelling and grammar
Use spellchecker and look out for common errors

Proofread as you go!

Don't forget time management!

Where do I start?

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Look at your question or topic

Make notes on what you already know

Identify the gaps in your knowledge. What do you need to find out?

Look at your reading list. Identify a starting point.

As you continue your reading, add to notes you made earlier and fill in the gaps.

GOOD TIP: Look out for authors or studies that are mentioned often.

Don’t just read information. Try to make **connections** between texts.

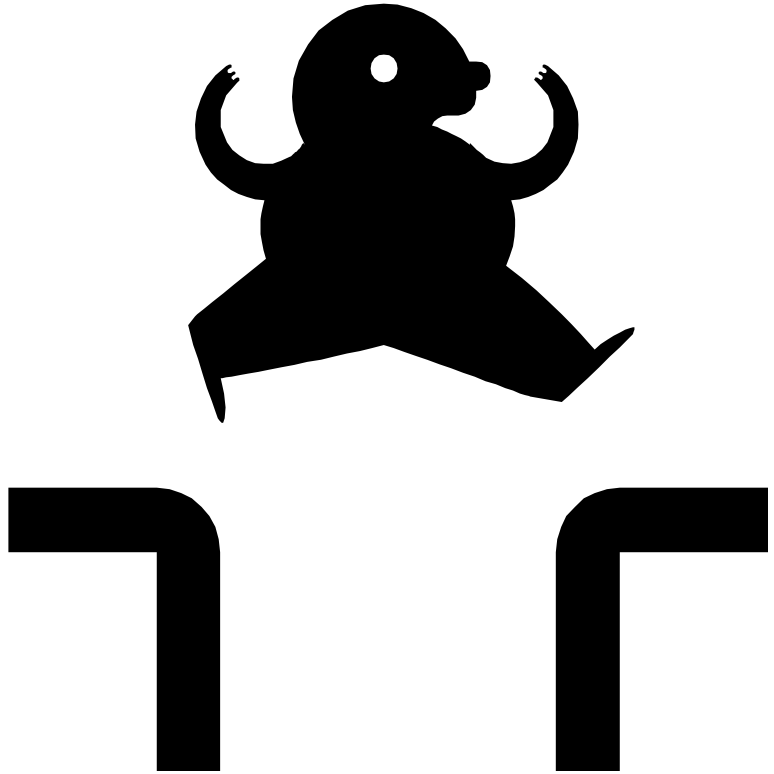
Always keep in mind how different texts link to **your** study.

Identify the **gaps**. It is these gaps that will justify your study!

Writing

What should I write about?

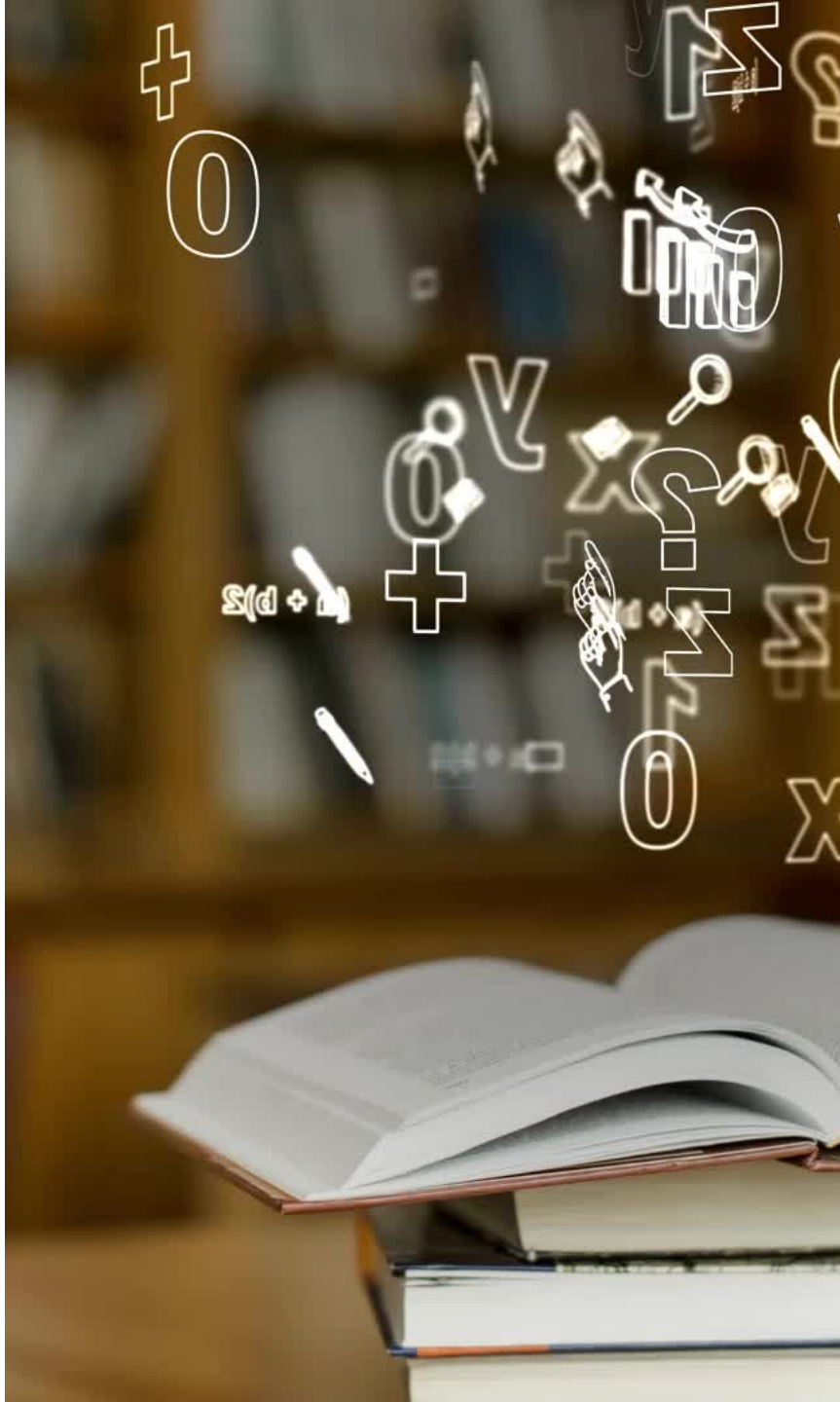
- What has already been written on the topic
- What has not been written on that topic
- How your research or project addresses the 'gap', or ‘weakness’ in the existing knowledge base
- Reviewing the literature is not simply reproducing/summarising, but showing how the literature relates to the research project.



How are they structured?

A background reading section is organised around and related directly to the research question or artefact you are developing

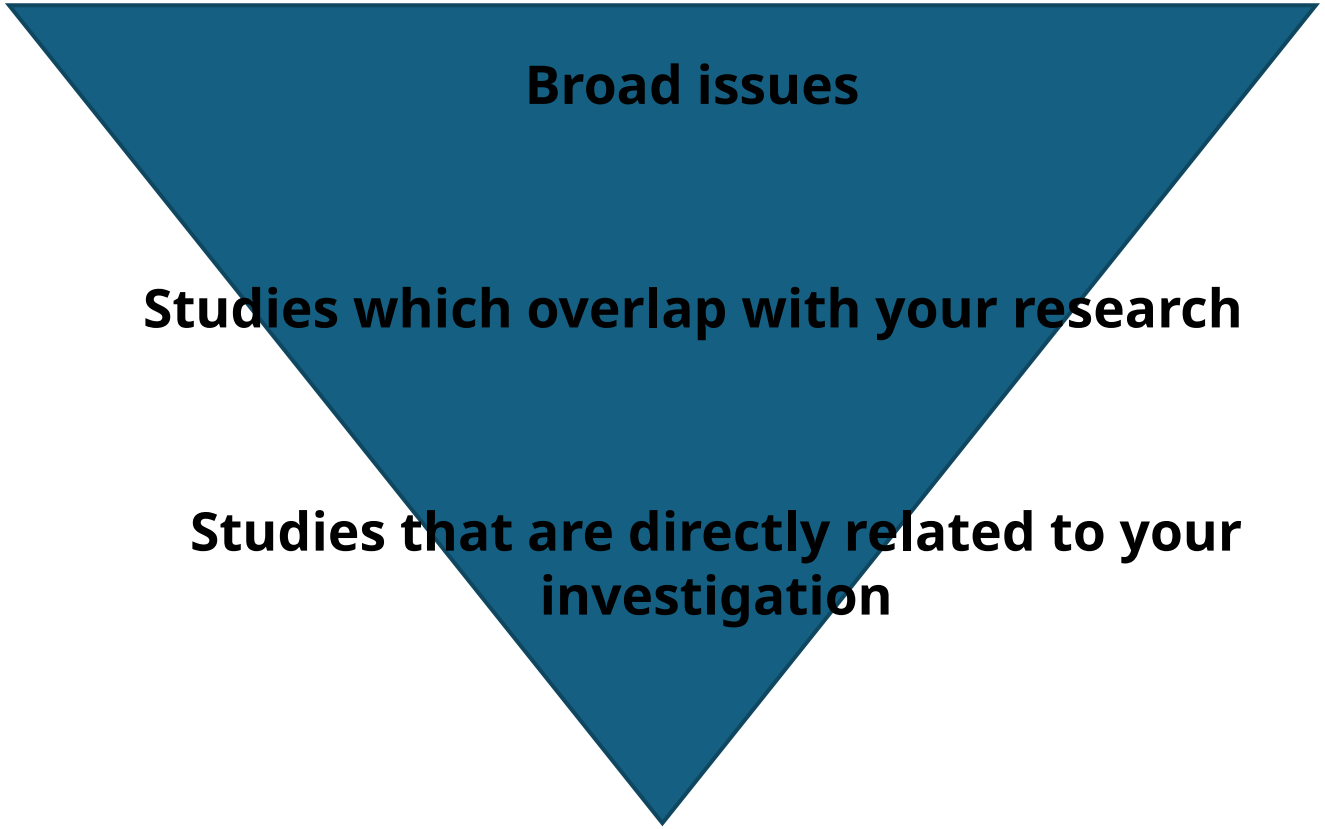
- ✓ Group authors who worked on similar themes & link ideas
- ✓ Make clear links between ideas inside the background reading section and your own research/progress on the artefact
- ✓ Evaluate material according to the main concept of your research question/artefact
- ✓ Your voice should remain central; the sources support what you are saying



Typical structure

General

Specific



SOMETIMES: **Brief conclusion summarising key points and gaps that your study will address**

(Adapted from University of Reading, n.d.)

it should…

- **Introduce** the reader to the topic area and provide the information needed to understand your research study
- **Create a summary** of what is, and is not, known in the topic area
- **Formulate questions** that need further research
- Lead to **specific aims** and objectives of your project
- **Justify** the need for your artefact

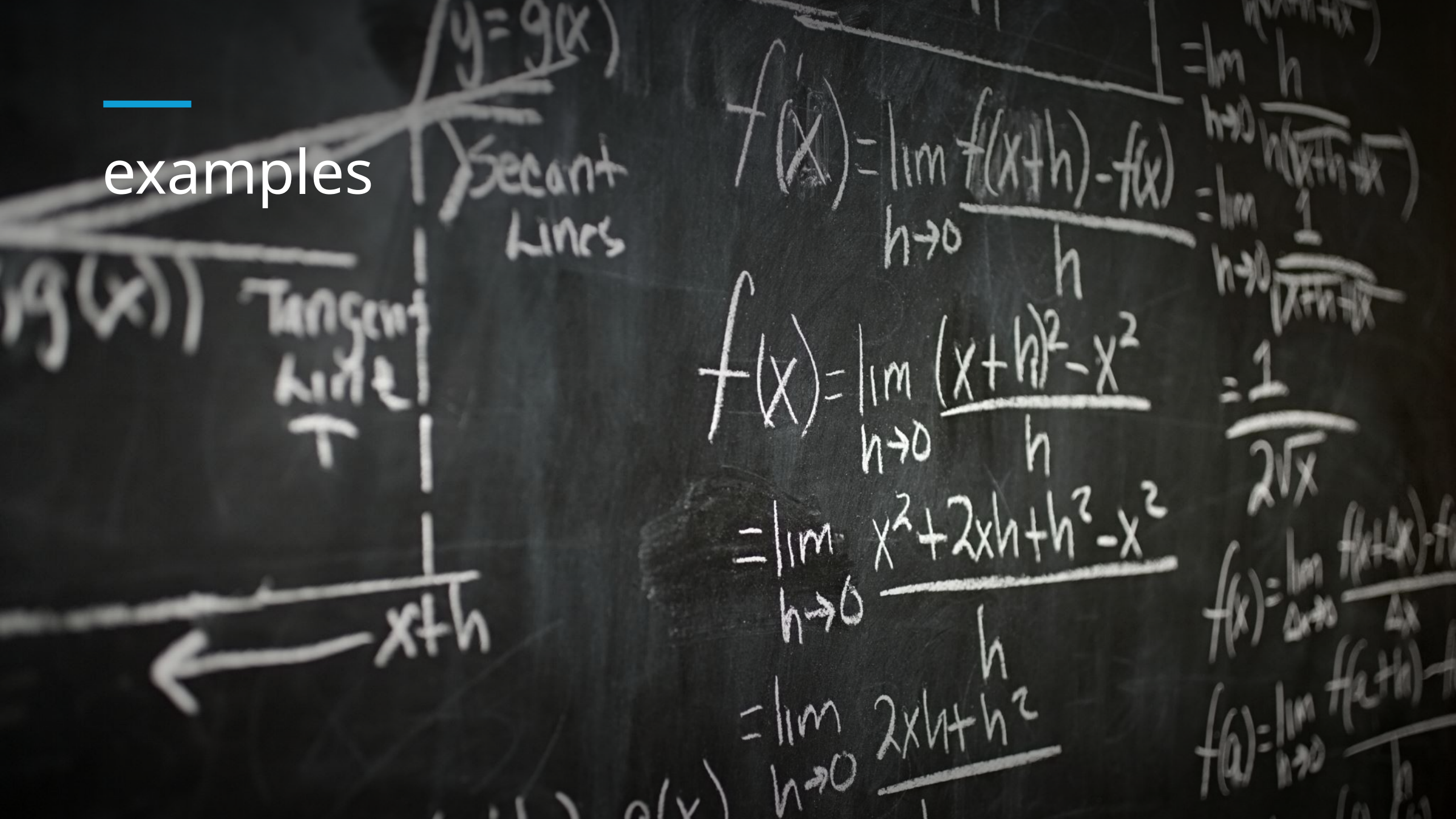
by...

- **Comparing and contrasting** different authors' views on an issue
- **Grouping** authors who draw similar conclusions
- **Criticising** aspects of methodology
- Highlighting **exemplary** studies
- Highlighting **gaps** in research
- Showing how your study will build on previous studies

It should not...

- Present a **list** of studies or authors that are discussed one-by-one
- Sound like a **story** or **descriptive account**

examples


y = g(x)
Secant Lines
Tangent Line
x+h
f'(x) = lim h→0 f(x+h) - f(x) / h
f(x) = lim h→0 (x+h)² - x² / h
= lim h→0 x² + 2xh + h² - x² / h
= lim h→0 2xh + h²

Example of a (poor) paragraph

JACHOWSKI (1964) developed a model investigation conducted on the interlocking precast concrete block seawall. After a result of a survey of damages caused by the severe storm at the coast of USA, a new and especially shaped concrete block was developed for use in shore protection.

HOM-MA and HORIKAWA (1964) studied waves forces acting on the seawall which was located inside the surf zone. On the basis of the experimental results conducted to measure waves forces against a vertical wall, the authors proposed an empirical formula of wave pressure distribution on a seawall.

SELEZOV and ZHELEZNYAK (1965) conducted experiments on scour of sea bottom in front of harbor seawalls, basing on the theoretical investigation of solitary wave interaction with a vertical wall using Boussinesque type equation.

Example of the beginning of such a paragraph

Research in the area of AS/RS has followed several avenues. Early work by Hausman, Schwarz and Graves (2007) was concerned with storage assignment and interleaving policies, based on turnover rates of the various items. Elsayed (2009) and Elsayed and Stern (2008) compared algorithms for handling orders in AR/RS. Additional work by Karasawa et al. (2007), Azadivar (2009) and Parry et al. (2007) deals with the design of an AS/RS and the determination of its throughput by simulation and optimization techniques. Several researchers addressed the problem of the optimal handling unit (pallet or container) size, to be used in material handling and warehousing systems. Steudell (2006), Tanchoco and Agee(2005), Tanchoco et al. (2009) and Grasso and Tanchoco (2007) studied various aspects of this subject.

Notice how the writers have:

- ***grouped*** **similar information**: "Steudell (2009), Tanchoco (2008) and Agee(2008), Tanchoco et al. (2005) and Grasso and Tanchoco (2009) studied various aspects of this subject.“

- **shown the relationship** between the work of different researchers, showing similarities/differences: "The general results, reflecting the stochastic nature of the flow of goods, *are similar to* those reported by Rosenblatt and Roll (2008).“

- indicated the **position** of the work in the research area history: "*Early* work by Hausman, Schwarz and Graves . . . “

- moved from a *general* discussion of the research in AS/RS to the more *specific* area (optimal container size) that they themselves are researching i.e. they relate previous work to their own to define it, justify it and explain it.

Formal academic style

- Write concisely
- In the 3rd Person (don’t use I, we, you)
- Be objective and respectful of others' opinions
- Don’t use emotive language or express strong personal opinions
- Choose your reporting verb carefully: don't use "says", but use "argues", "claims" or "states”
- Manchester Academic Phrasebank

Tense

Use the **present** tense for general opinions and theories, or the **past** when referring to specific research or experiments:

- *Although Trescovick (2001) argues that attack is the best form of defence, Boycott (1969) claims that …*
- In a field study carried out amongst the homeless of Sydney, Warne (1999) found that …

Flow

- Flow is interrupted when the reader pauses to understand
- Provide clear explanations
- Avoid one sentence paragraphs
- Leave out material that does not contribute directly to the discussion, argument, or development of a theme or idea

Final suggestions

- Keep revising your work on this section – it will be a work in progress
- Continue reading around the subject & adding to the section
- Re-read the State of the Art section at least once a week and keep improving it

Summary

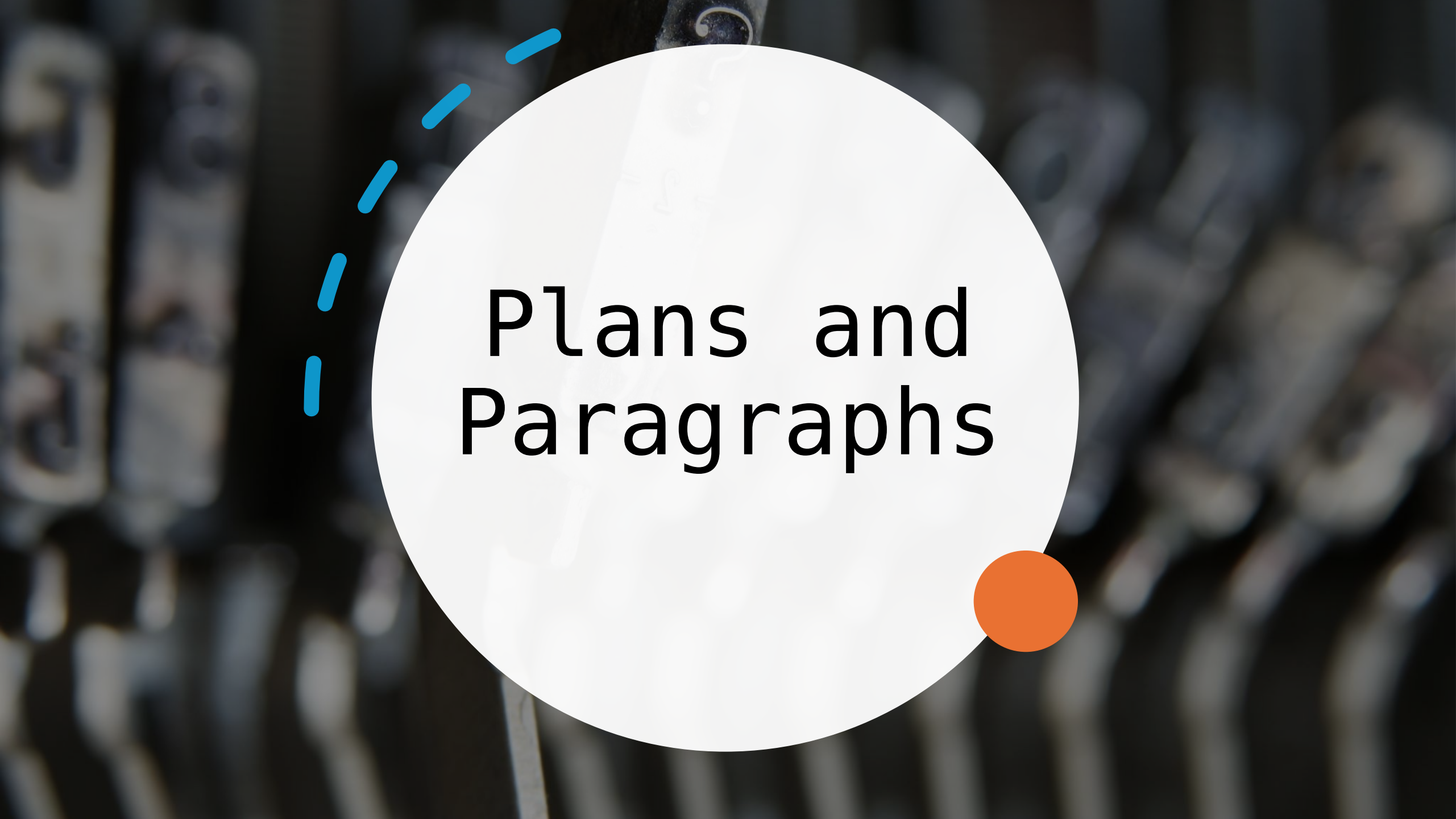
- Stay strictly relevant to your research topic
- Reference accurately and consistently
- Make it obvious why you are carrying out your research in light of your readings

Reference list and useful websites

Higher Education Academy (2011). *Deep and surface approaches to Learning.* [online] Available at: http://exchange.ac.uk/learning-and-teaching-theory-guide/deep-and-surface-approaches-learning.html [Accessed 9th April 2015].

Lincoln University. (n.d.). *What is a literature review? http://library.lincoln.ac.nz/Research/Writing-your-research/Literature-Reviews/What-is-a-literature-review/* 19/02/15

University of Reading. (n.d.). *Starting a literature review*. http://www.reading.ac.uk/internal/studyadvice/StudyResources/Essays/sta-startinglitreview.aspx 19/02/15



Plans and Paragraphs

Make a plan

Theme 1

Idea 1

Idea 2

Idea 3

Theme 2

Idea 1

Idea 2

Idea 3

Theme 3

Idea 1

Idea 2

Idea 3

Idea 4

Theme 4

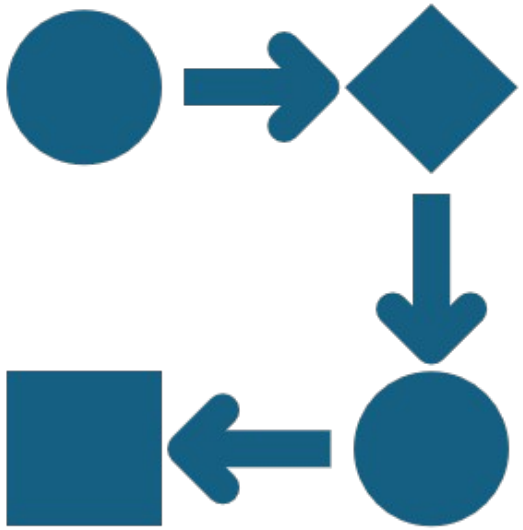
Idea 1

Idea 2

Idea 3

Idea 4

Idea 5

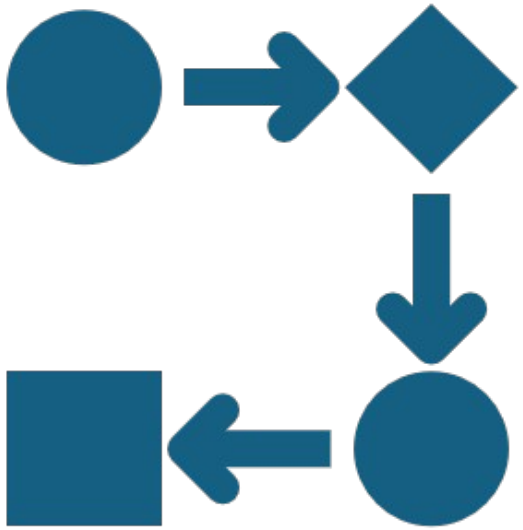


Paragraphs have a structure

A paragraph should have one **main idea.**

This main idea is usually expressed clearly in one sentence, the first, or '**topic sentence**'.

Paragraphs have a beginning, middle and an end. The sentences in the middle explain, develop, illustrate or modify the main idea in the topic sentence. The last sentence often returns to the idea in the topic sentence to show how it has developed.



Read: the main idea is first, and you know that this idea will develop before you move on

Plan: each paragraph develops a single point. You can link related points and plan the overall structure

Write: start with a clear statement of the point you are making, then add detail. Start a new paragraph when you start a new point

Theme 1

Idea 1

Idea 2

Idea 3

Each idea here becomes one paragraph.

For offsite construction to make a significant contribution to the UK market, it is necessary to consider its perceived benefits and shortcomings. Factors such as quality, time and cost are integral to such deliberations. In a study exploring the opinions of groups involved in UK construction, Goodier and Gibb (2007) uncovered many contradicting accounts of the offsite method. For instance, though respondents identified reduced initial and whole life costs as a clear advantage, overall cost was nevertheless highlighted as a principal obstacle to the popularity of offsite construction. Similarly, despite the proposal of various costing solutions, the research remarked that many still failed to fully take into consideration the hidden financial effects that improved quality and reduced snagging could have. It is therefore crucial that project teams considering offsite construction do so following a more engaged, deeper assessment of its merits and limitations. Furthermore, with the age of such research, and no concrete measure to prove or disprove the opinions obtained, it is essential that more up-to-date, robust research is undertaken to confirm or refute these perceptions. Not doing so could mean that the UK continues failing to fully capitalise on the financial advantages offsite construction can have in a changing market.

Step 1

Write a **topic sentence** to express the MAIN IDEA of the paragraph

Step 2

Clarify & expand the topic sentence

- explain or define any abstract, key or problematic terms

Step 3

Show your evidence to support the main idea

- This allows you to support you argument/idea with academic references.

Step 4

Comment on the evidence

- show how it supports or develops the main idea
- if it's appropriate mention other evidence (examples, case studies, experiments, interpretations) to widen the discussion

Step 5

Conclude by explaining **consequences or implications** and then link to the next paragraph

- Look back at your topic sentence
- How have you moved on/developed the idea?
- Where are you going next?

If you are really stuck …

1. Ask yourself Why am I writing about this? Justify your text and direction in your own head .

2. Try to write content that means the reader/marker doesn't ask themselves *So what?* If they are, you have a problem because they don't understand or follow your content or know why it's there.

Can I use … *I*

Yes, but be careful.

Using … *I* … tends to lead to informal writing … so use it sparingly.

EDIT ONE

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In the mid 2000's, the empirical evidence for the effectiveness of games as learning environments was scant (O'Neil et al., 2005). While some research claimed that learning with interactive environments such as games and simulations is only effective when supported by effective instructional measures (Egenfeldt-Nielsen, 2006), other reports record a negative effect of games on learning, but a positive effect on motivation (Rieber, 2005). More recent reviews of empirical evidence on the benefits of computer games for learning across the curriculum find that the most frequently occurring impacts are improved knowledge acquisition and content understanding and affective and motivational outcomes (Connolly et al., 2012: 661). Other publications encourage and validate the use of computer games for learning and suggest the need for a pedagogy of games (Ulicsak and Williamson, 2010). Latest evidence for games based-learning in schools (Perotta et al., 2013) suggests that there is a split in the literature regarding the extent to which computer games impact on academic achievement, where some studies observe improvements and others do not. However, it is a consistent finding that computer games have a positive impact on problem solving skills, broader knowledge acquisition, motivation and engagement. Attitudes to learning are improved when games and simulations are used, compared to traditional methods, but the evidence for improved attainment is less secure (ibid.). **[218]**

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EDIT TWO

In 2005, empirical evidence demonstrating the effectiveness of games as learning environments was rare (O'Neil et al., 2005). Some research claimed that games and simulations needed supplementing with clear instruction to be effective (Egenfeldt-Nielsen, 2006), while others showed a positive effect on motivation coupled with a negative effect on learning (Rieber, 2005). Recent evidence, taken from across the curriculum, suggests some positive impact on knowledge acquisition, content understanding, as well as affective and motivational outcomes (Connolly et al., 2012). Other publications even propose the need for a games led pedagogy (Ulicsak and Williamson, 2010). In the end, however, the overall evidence supporting the efficacy of games based-learning in schools is inconclusive (Perotta et al., 2013). Attitudes to learning are certainly enhanced when games and simulations are employed in a teaching context, but the evidence for improved attainment is less secure. **[140]**

For offsite construction to make a significant contribution to the UK market, it is necessary to consider its perceived benefits and shortcomings. Factors such as quality, time and cost are integral to such deliberations. In a study exploring the opinions of groups involved in UK construction, Goodier and Gibb (2007) uncovered many contradicting accounts of the offsite method. For instance, though respondents identified reduced initial and whole life costs as a clear advantage, overall cost was nevertheless highlighted as a principal obstacle to the popularity of offsite construction. Similarly, despite the proposal of various costing solutions, the research remarked that many still failed to fully take into consideration the hidden financial effects that improved quality and reduced snagging could have. It is therefore crucial that project teams considering offsite construction do so following a more engaged, deeper assessment of its merits and limitations. Furthermore, with the age of such research, and no concrete measure to prove or disprove the opinions obtained, it is essential that more up-to-date, robust research is undertaken to confirm or refute these perceptions. Not doing so could mean that the UK continues failing to fully capitalise on the financial advantages offsite construction can have in a changing market.