

Reverse-engineering I — IMRaD architecture

Week 4 · 2105620 Research Communication Skills for Chemical Engineers

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This week has no classroom

1

Watch

three recordings, about fifteen minutes each. Watch them in order

2

Do

the reverse outline of the paper you already chose. One page

3

Submit

before Week 5. It is the front half of Assignment 1, not extra work

What the three recordings do



One

What each section is for

The four jobs of a paper, and the promises the sections make to each other



Two

The reverse outline

How to see a structure you cannot see while reading forward



Three

Where arguments break

Five failures that are invisible in the text and obvious in the outline

SEGMENT ONE • ABOUT 15 MINUTES

What each section is for

Four sections, four jobs — and four promises the sections make to each other.

A paper is not a report of what
you did, in the order you did it.

It is an argument, assembled so that a stranger can check it.

Four sections, four jobs

Introduction

Establishes that a specific question is worth answering, and that it is not yet answered

Methods

Makes the answer checkable. Someone else could do this and find out whether you are right

Results

States what was observed. Nothing about what it means

Discussion

Converts observation into claim, and states the boundary of that claim

The sections make promises to each other

1

Every

aim

stated in the Introduction is answered in the Results

2

Every

number

in the Results is produced by something in the Methods

3

Every

claim

in the Discussion traces back to a specific Result

4

Nothing

new

appears in the Discussion — no new data, no new method

Where sections do each other's jobs

- **Results that interpret**

- “the improvement is attributed to a more uniform interphase”. Nothing was observed. That belongs in the Discussion

- **A Discussion that reports**

- three paragraphs restating the figures. The reader has already read the figures

- **Methods that argue**

- “this technique was chosen because it is superior to X”. Justification, not procedure

The abstract is the same argument, compressed

Sentence 1–2

The context, and the specific problem — the Introduction

Sentence 3

What was done — the Methods

Sentence 4–5

What was found, with numbers — the Results

Sentence 6

What it means, and how far — the Discussion

You cannot see a structure
while you are reading forward.

Which is why the next fifteen minutes exist.

The reverse outline

One line per paragraph, recording what the paragraph does. Five steps, and you will use it for the rest of your career.

An outline written backwards, from a finished text

One line per paragraph, recording **what the paragraph does** — not what it says.

- A **summary**
compresses content. It tells you the paragraph is about
zinc dendrites
- A **reverse outline**
records function. It tells you the paragraph
narrows a general problem to a specific one
- Only the second one lets you see whether the argument
holds together

Five steps

1

Number the paragraphs

— in the margin, or as a list. You will refer to them by number from here on

2

Write the function in ten words or fewer

— start with a verb. If it will not fit, the paragraph has more than one job

3

Tag each line with the job it serves

— Introduction, Methods, Results or Discussion, regardless of the section it is printed in

4

Collapse to section level

— read the lines for one section together and write a single line for the section

5

Read only the outline

— close the paper. Everything wrong with the architecture is now on one page

Verbs that describe a job

establishes situates

Puts the work in a context the reader already accepts

narrows specifies

Moves from a general area to a particular question

reports quantifies

States an observation, with or without numbers

justifies motivates

Gives a reason for a choice

contrasts reconciles

Sets two findings against each other, or resolves them

concedes bounds

Admits a limit on what can be claimed

claims attributes

Asserts a mechanism or an explanation

Worked example — an Introduction, outlined

P1	Establishes that grid storage demand is growing
P2	Narrows to aqueous zinc as a low-cost option
P3	Reports that dendrites limit zinc anode lifetime
P4	Reviews electrolyte additives as a mitigation
P5	Narrows to aqueous zinc as a low-cost option
P6	States the aim: screen four additives at high current density

What a healthy Introduction looks like in outline

1

Establishes

a context the reader already accepts

2

Narrows

, once or twice, each time tighter

3

Reports

what is known, and then what is not

4

States the gap

— as a cost, not as an absence

5

States the aim

, in terms that the Results can answer

Worked example — a Discussion, outlined

P1	Restates the main finding
P2	Attributes the effect to a more uniform interphase
P3	Compares the result with two earlier studies
P4	Restates the main finding, with different wording
P5	Concedes that only symmetric cells were tested
P6	Proposes future work on full cells

When a paragraph will not fit in ten words

- **Two verbs in your line**
 - the paragraph is doing two jobs. It should usually be two paragraphs
- **No verb you are happy with**
 - the paragraph may be doing no job at all. Ask what would be lost by deleting it
- **The line is longer than the paragraph deserves**
 - a common sign of a literature-review paragraph that wandered in

Ten words. A verb.

Function, not content.

Everything in segment three depends on you doing it that way.

Where arguments break

Five failures that are invisible in the text and obvious in the outline. This segment is where your submission comes from.

Five breaks, all invisible in the text

The orphan aim	An aim in the Introduction with no matching Result
The unsupported claim	A Discussion claim with no Result behind it
The invisible method	A number in the Results that no Method produces
The doubled move	Two paragraphs with the same function
The buried gap	The gap arrives late, or never arrives at all

The orphan aim

Introduction, P6

States three aims: screen additives, identify the mechanism, assess full-cell viability

Results

Reports screening. Reports post-mortem imaging.

Discussion

Claims a mechanism. Says nothing about full cells.

The unsupported claim

Discussion, P3

Attributes the improvement to a more uniform interphase

Results

Reports cycle life, voltage hysteresis, and surface images

The problem

No measurement of the interphase exists anywhere in the paper

The invisible method

Results

Reports coulombic efficiency of 99.4 % over 400 cycles

Methods

Describes cell assembly, electrolyte preparation, and cycling protocol

The problem

No definition of how efficiency was calculated, and no statement of what counts as failure

How to write a finding

Location · Function · What is missing



Introduction P6 states an aim on full-cell viability. No Result addresses it and the Discussion does not acknowledge the omission.



The introduction is not very well connected to the results.

Outline your own draft
before a reviewer does.

The five breaks are cheap to fix at outline stage and expensive after submission.

What you submit

1

The outline

— numbered lines for the Introduction and the Discussion of your chosen paper. Ten words, verb first

2

The collapse

— one line for each of those two sections

3

Two findings

— written as location, function, what is missing

4

The AI declaration

— attached, as for every assignment from Week 3 onwards

THREE THINGS

Before Week 5

- **Submit the outline.**
- **Keep the paper.**
- **Bring the matrix too.**

Before the Week 5 session, not during it

Week 5 takes an Introduction apart move by move, using yours

Week 5 asks you to write the gap statement your matrix implies

NEXT • WEEK 5 • 3 AND 6 SEPTEMBER

Reverse-engineering II — the Introduction and the gap

Bring the outline you submitted and the evidence matrix from Week 3. Week 5 is a working session.

BEFORE YOU CLOSE THE VIDEO • 45 SECONDS

How was this week?

Five questions. Anonymous — no name, no email, no login.

The fourth question is the one I actually use.

An asynchronous week is the one I can see least. This form is the only signal I get.

oxidized-challenge-ed9.notion.site



Scan it before you close the tab