

Writing Class 4: English Academic Writing Style

Mathematical Modeling Lecture

Mathematical Modeling

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Session Route

Launch

Question

Motivating context, key vocabulary, and the first modelling decision.

Build

Method

Worked example, diagram or table, calculation, and parameter meaning.

Test

Critique

Checkpoint practice, limitation check, and communication of results.

Columns are used where comparison helps; explanation slides stay clean and spacious.

From Structure to Language

Core explanation, worked reasoning, and application

From Structure to Language

In W1–W3 we focused on *structure*: what sections appear, in what order, with what content. In this class we focus on *language*: how a sentence in a competition paper should look and sound.

Two facts motivate this class:

- For IMMC International and HiMCM, English is required. Many teams write English that is grammatically correct but does not sound like a scientific paper. Judges notice immediately.
- Even a paper with strong content can be marked down for awkward prose. Conversely, prose that sounds confident and conventional flatters the content.

This class is *not* a remedial English class. It will not teach articles, tenses, or grammar; we assume that level. The aim is to bridge the gap from “correct English” to “the English of a scientific paper”.

Note: An honest framing

Most members of a Macau/Hong Kong team are not native English writers. That is fine. **Judges do not expect native-level fluency; they expect register-appropriate prose.** A consistent, plain, scientific register beats a flowery, ambitious one every time.

Plain is good. Plain is professional. Plain is what scientific writing actually looks like.

The Two-Voice Rule

Core explanation, worked reasoning, and application

The Two-Voice Rule

Scientific English makes heavy use of *both* active and passive voice. Choosing well is half the battle.

Method: Method: When to Use Each Voice

- **Active voice** when *the team* is the agent and the team's choice matters: “We assume...”, “We define...”, “We recommend...”, “We model the population as...”. Use whenever the team is acting.
- **Passive voice** when the *process or result* matters more than who did it: “The system is described by...”, “Data was collected from...”, “Parameters are estimated using...”. Use for procedures, definitions, and standard operations.

Bad writing comes from overusing either: all-passive sounds stiff and bureaucratic; all-active reads like a personal diary.

Worked Example: Example 1: Mixing Voices Well

We model the population as a logistic growth process (active). The carrying capacity K is estimated from satellite data over the period 2010–2020 (passive). We choose this estimation window because earlier data are less reliable (active). Standard least-squares regression is applied, yielding $K \approx 1,240$ animals (passive). We then compare this estimate against a published 2018 census of 1,195 animals (active).

Note: Why this paragraph works

Notice the rhythm: *active, passive, active, passive, active*. The team's choices and judgments are in active voice; the data-processing and standard operations are in passive. This is the natural rhythm of a scientific paragraph.

Method: Method: How to Refer to Yourself

- **Use “We”:** the convention in 99% of modeling papers. Comfortable, unpretentious, accurate for a team paper.
- **Do not use “I”** unless the paper is single-authored.
- **Do not use “the authors”** in self-reference. It reads as evasive and dated. Reserve it for citing other papers (“the authors of ...”).
- **Avoid the impersonal** “It is decided that...” or “It was felt...”. These hide the agent and sound bureaucratic.

Hedging: How to Sound Honest Without Sounding Weak

Core explanation, worked reasoning, and application

Hedging: How to Sound Honest Without Sounding Weak

Hedging is the practice of qualifying claims. In scientific writing, hedging signals integrity (you know the limits of your work). Done badly, it sounds evasive or insecure. Done well, it sounds rigorous.

Method: Method: The Hedging Vocabulary

Common scientific-paper hedges, from weak to strong:

Modal verbs	may, might, could, can
Adverbs	approximately, roughly, broadly, plausibly, possibly, likely, presumably
Verbs of estimation	we estimate, we suggest, we infer, we conjecture, we expect, we find that
Conditionals	under the assumption that, in the regime where, provided that
Quantitative hedges	within a 5% margin, to first order, in most scenarios tested

Worked Example: Example 2: Three Levels of Hedging

Too strong (overclaims):

Our model proves that the optimal staffing level is 3 baristas.

Problem: “Proves” is the language of mathematics. A model does not *prove* anything; it *suggests* or *indicates*. Judges will note the overclaim.

Too weak (overcautious):

Our model might possibly suggest that maybe the staffing level could perhaps be approximately around 3 baristas in some cases.

Problem: Five hedges. The reader cannot tell what is being claimed.

Right (one calibrated hedge):

Under our assumptions, the model recommends 3 baristas, with sensitivity analysis confirming this recommendation across a $\pm 20\%$ range in arrival rate.

Why it works: “Under our assumptions” is one explicit hedge, immediately backed by a quantitative robustness claim. The recommendation reads as confident yet honest.

Warning: Warning: When NOT to Hedge

Do not hedge in:

- Definitions: “*The utilisation is defined as...*” (not “*may be defined as...*”).
- Mathematical statements: “*By Eq. (3), $W_q = 16 \text{ min}$* ” (not “*may approximately equal 16 min*”).
- Recommendations after sensitivity: be honest about uncertainty in the analysis section, then make a clean recommendation. Hedging the recommendation itself reads as a failure to commit.

Connecting Sentences: The Logic of Flow

Core explanation, worked reasoning, and application

Connecting Sentences: The Logic of Flow

Scientific writing is heavy with *connective words*: words that show how one idea relates to the next. Good connections make the paper feel inevitable; bad connections (or none) make the reader feel lost.

Method: Method: Connective Vocabulary by Purpose

Purpose	Connectives
Addition	moreover, in addition, further, furthermore
Contrast	however, in contrast, conversely, on the other hand, yet, but
Cause / Consequence	therefore, hence, thus, consequently, as a result, accordingly, it follows that
Specification	specifically, in particular, for instance, namely
Generalisation	in general, broadly, overall, on balance
Sequence	first, next, finally, subsequently, ultimately
Concession	although, while, despite, even though, nevertheless, nonetheless
Restatement	in other words, that is, equivalently, put differently

Worked Example: Example 3: With and Without Connectives

Without:

Our baseline model predicts an average wait time of 4 minutes. We tested the sensitivity to arrival rate. The wait time changed substantially. We added a second server. The wait time dropped to 1.5 minutes. We recommend two servers during peak hours.

With:

Our baseline model predicts an average wait time of 4 minutes. However, sensitivity analysis to arrival rate revealed substantial fluctuations. We therefore explored a two-server configuration, which reduced average wait time to 1.5 minutes. Accordingly, we recommend deploying two servers during peak hours.

Warning: Warning: Overusing Connectives

Every sentence does not need a connective. Connectives are like joints: they go where direction *changes*. If consecutive sentences continue the same thread, no connective is needed (and one would feel intrusive). Use connectives where the logic turns or where the reader might otherwise get lost.

Common Chinglish Patterns and Their Fixes

Core explanation, worked reasoning, and application

Common Chinglish Patterns and Their Fixes

This section is the one where we are most direct. We list common patterns produced by Chinese-/Cantonese-speaking writers in English scientific contexts, and we give specific fixes.

Warning: Warning: Why Chinglish Hurts You Specifically in Competitions

Judges of international competitions read hundreds of papers per year, many by non-native writers. They recognise Chinglish patterns instantly. The problem is not that the prose is technically incorrect — it is that it signals the team did not have a native (or near-native) reader review the paper. Teams that fix the patterns below are immediately read more carefully.

Pattern 1: Long, Multi-Clause Sentences

Chinese tolerates very long sentences (commas as clause separators); English does not.

Worked Example: Example 4: Long Sentence → Three Sentences

Chinglish:

In our model, we use the SIR framework to describe the spread of the disease, and we assume that the infection rate is constant, which is a simplification, and we then solve the system using the Runge-Kutta method, obtaining the time evolution of S , I , and R .

English:

We model the disease using the SIR framework with a constant infection rate. While this is a simplification, it permits closed-form analysis. We solve the system using the Runge-Kutta method and obtain the time evolution of S , I , and R .

Pattern 2: Overuse of “Which”

Chinese has no relative pronouns; English writers from Chinese backgrounds compensate by overusing “which”.

Worked Example: Example 5: "Which" Overuse

Chinglish: *We used the optimal value, which is calculated from the equation, which gives the result, which we present in Table 3.*

English: *We computed the optimal value from Eq. (3) and report the result in Table 3.*

Method: Method: Wordy Phrases → Concise Replacements

Wordy (avoid)	Concise (prefer)
in order to	to
due to the fact that	because
at the present time	now
in the event that	if
in spite of the fact that	although
a large number of	many
the majority of	most
on a daily basis	daily
with regard to / with respect to	regarding / about
it should be noted that	note that
as a matter of fact	in fact
it is important to mention that	importantly,
for the purpose of	to / for
in close proximity to	near
prior to	before
subsequent to	after

Worked Example: Example 6: Wordiness → Concision

Wordy:

In order to test the validity of our model, we performed a large number of simulations. Due to the fact that the variance was small, we may say that the results are robust. It should be noted that prior to the analysis, we cleaned the data with regard to outliers.

Concise:

To validate our model, we performed many simulations. Because the variance was small, the results are robust. Note that before the analysis we removed outliers from the data.

Pattern 4: Missing or Misused Articles

Chinese has no articles (“a”, “an”, “the”). This is the single most common Chinglish flag.

Method: Method: A Three-Question Article Test

For every singular countable noun, ask:

1. Is the noun *specific* (the reader knows which one)? Use **the**.
2. Is it *any one of a class*, mentioned for the first time? Use **a** or **an**.
3. Is the noun in its general sense, abstract, or uncountable? Use **no article**.
4. Plural countables in general sense: **no article**.

Examples:

- *A model is built. The model has three parameters. We modified the model.* (First instance: any one. Subsequent: that specific one.)
- *Simulation is a powerful tool.* (General sense: no article.)
- *Data was collected.* (“Data” is treated as uncountable: no article.)
- *The data we collected showed...* (specific data: “the”.)

Method: Method: Common Connective Confusions

- **“Besides”** in academic English means “in addition to (a previously mentioned thing)”. Avoid using it as a generic “moreover” because it sounds informal.
 - ✗ *Besides, we ran more simulations.*
 - ✓ *In addition, we ran more simulations.* or simply *We also ran more simulations.*
- **“On the other hand”** should be paired with “on the one hand” (or implied). Otherwise, use “in contrast” or “however”.
- **“At the same time”** usually means temporal simultaneity, not logical concurrence. Use “meanwhile” or “also”.
- **“As we all know”** is rarely appropriate in a paper. Replace with a citation or simply state the fact.

Worked Example: Example 7: Idiomatic Verb-Noun Pairs

Some verb-noun pairs translate idiomatically in English in ways that differ from their Chinese counterparts. Some traps:

- ✗ “*do a research*” ✓ “conduct research” or “perform research”
- ✗ “*open a meeting*” ✓ “hold a meeting”
- ✗ “*learn a knowledge*” ✓ “acquire knowledge” (uncountable)
- ✗ “*study at home*” (when meaning university) ✓ “study domestically” or “study at home university”
- ✗ “*problem solving*” as a verb ✓ “solve the problem”
- ✗ “*make a decision to do*” ✓ “decide to do” (verb is shorter than noun)

Pattern 7: Topic-Comment Sentences

Chinese sentences often start with a topic, even where the topic is not the grammatical subject. English needs a clear subject-verb-object spine.

Worked Example: Example 8: Topic-First → Subject-First

Chinglish: *For our model, the assumption of independence is important.*

English: *Our model requires the assumption of independence. or Independence is a crucial assumption of our model.*

Chinglish: *In the simulation, the result was robust.*

English: *The simulation result was robust. or Our simulation produced robust results.*

Diagnosing and Polishing a Paragraph

Core explanation, worked reasoning, and application

Diagnosing and Polishing a Paragraph

This section illustrates the kind of careful revision a strong team applies to every paragraph in the final 12 hours of a competition.

Worked Example: Example 9: A Full Paragraph Polish

First-draft Chinglish:

In order to do the validation of our model, we have done a lot of work. First of all, we collected the data from the Hong Kong government website, which we then cleaned, which took us a long time. After that, we run our model with the data, which produced the output, which we compared with what the literature says. The result is, our model is generally consistent with the literature, which we think is a good thing. Besides, we also did sensitivity analysis, which is in the next section.

Polished version:

To validate our model, we collected daily reports from the Hong Kong Department of Health for the period 2019–2021. After removing duplicate entries, we ran our model on the cleaned dataset and compared the predicted values against published estimates. The model agreed with the literature to within 7% across the period, supporting the validity of our approach. Sensitivity analysis is treated separately in §7.

Word count: 86 words → 59 words. The polished version is shorter, clearer, and more confident.

Method: Method: The "Polish Pass" Procedure

In the last 8–12 hours, do a polish pass on every paragraph:

1. Read each sentence aloud. If it sounds awkward, rewrite.
2. Cut every wordy phrase (use the table in §5.3).
3. Replace “which” chains with two simple sentences.
4. Ensure each paragraph has *one* main idea.
5. Check articles in every singular countable noun.
6. Verify the connective at the start of each paragraph still makes sense in context.

Allocate one teammate as the dedicated polisher for the last 6 hours — ideally someone with the strongest English. This role is as important as the modeler or coder during this final phase.

Workshop Exercises

Core explanation, worked reasoning, and application

Exercises: Exercise W4.1: Active/Passive Identification

Take any of the example paragraphs in W1–W3. Label each verb as active or passive. Count the ratio. Is it natural? Does it follow the rhythm described in §2?

Exercises: Exercise W4.2: Polish a Paragraph

The following paragraph is from a constructed weak paper. Polish it using the techniques from this class. Aim to cut 30% of words without losing any content.

In order to do the analysis of our problem in a thorough way, we have decided to make use of the method which is known as Monte Carlo simulation, which is widely used in the modeling field, which has many advantages such as its flexibility and which can be applied to a large number of different situations. Besides, we also chose to use Python as the programming language, because of the fact that Python has many libraries, which are useful, and which we are familiar with. The result of our simulation is shown in Figure 3, which can be seen above.

Exercises: Exercise W4.3: Hedging Calibration

For each statement, rewrite with appropriate hedging (neither overclaiming nor over-hedging).

1. Our model proves the optimal staffing is 3 servers.
2. This result is definitely correct under all conditions.
3. Maybe our analysis might possibly suggest some kind of optimum exists.
4. Our recommendation will definitely solve the problem completely.
5. This conclusion might possibly perhaps be approximately right.

Exercises: Exercise W4.4: Detect the Chinglish

Read each sentence and identify which Chinglish pattern (from §6) it exhibits. Then rewrite.

1. *For our research, the most important thing is the data.*
2. *We did a research on the bus routing problem, which is interesting, which has many applications.*
3. *In order to in the future make our analysis more comprehensive, we plan to do additional studies.*
4. *There are a large number of citizens who are using the bus on a daily basis.*
5. *Besides, our model also can be used to predict the future trend.*

Exercises: Exercise W4.5: Find a Native Reader

During practice runs, ask a teacher (ideally a native English speaker, or someone who reads English papers regularly) to read your Summary and identify three sentences they would rewrite. Compare with your own rewrite of those sentences. Where do you and the reviewer disagree, and why?

What to Carry Into W5

Core explanation, worked reasoning, and application

Note: Class W4 Take-aways

1. Mix active and passive voice; use active for team choices, passive for procedures.
2. Hedge enough to be honest, not so much that meaning vanishes.
3. Use connectives where logic changes; do not use them in every sentence.
4. English does not tolerate the long, comma-spliced sentences that Chinese tolerates. Break them.
5. Articles, “which”-chains, and topic-first sentences are the three most common Chinglish patterns; fix them on every pass.
6. Allocate one teammate as the dedicated polisher for the final hours.

What to Carry Into W5

In **W5: LaTeX, Figures and Visual Communication** we move beyond words to the visual presentation of the paper: typesetting, figures, tables, and the workflow that makes everything come together at submission.

Appendix A: Quick-Reference Style Sheet

Core explanation, worked reasoning, and application

Appendix A: Quick-Reference Style Sheet

- First person plural “we”; never “I”, “the authors”, or “one”.
- Mix active and passive voice; alternate by paragraph rhythm.
- Hedge with quantitative qualifiers (“within 5%”) rather than vague adverbs (“somewhat”).
- Cite numerically: “In our simulation we observe X (see Fig. 3)”.
- Equations: punctuate as parts of sentences, with commas and periods after them as needed.
- Numbers: spell out below ten in narrative prose (“three models”); use digits in technical contexts (“ $N = 3$ ”).
- Units always with a non-breaking space: 200~m renders as “200 m”.
- Avoid contractions: “do not”, not “don’t”.

Appendix B: Top 30 Phrases to Replace

Core explanation, worked reasoning, and application

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- “in order to” → “to”
- “due to the fact that” → “because”
- “in spite of the fact that” → “although”
- “it should be noted that” → “note that”
- “a large number of” → “many”
- “the majority of” → “most”
- “a number of” → “several” or a count
- “the fact that” → usually deletable
- “regarding” / “with respect to” → “about” or “on”
- “in close proximity to” → “near”
- “prior to” → “before”
- “subsequent to” → “after”
- “utilise” → “use”
- “commence” → “start”
- “terminate” → “end”
- “demonstrate” (often) → “show”
- “investigate” → “study”
- “in the event that” → “if”
- “at the present time” → “now”
- “at some future date” → “later”
- “in light of the fact that” → “because”
- “it is necessary that” → “must”
- “in many cases” → “often”
- “in most cases” → “usually”
- “serves to” → usually deletable
- “has the ability to” → “can”
- “is in a position to” → “can”
- “does not have the ability to” → “cannot”
- “in the same way” → “similarly”
- “with the result that” → “so”

Appendix C: A Recommended Final-Hours Editing Procedure

Core explanation, worked reasoning, and application

Appendix C: A Recommended Final-Hours Editing Procedure

1. **Hours** $T - 12$ **to** $T - 8$: Read the entire paper top to bottom. List sections needing improvement.
2. **Hours** $T - 8$ **to** $T - 4$: Address the list. Polish prose. Re-check all numbers, units, figure captions.
3. **Hour** $T - 4$ **to** $T - 2$: Polish the Summary specifically. Read it aloud. Confirm a stranger could find the headline answer in 10 seconds.
4. **Hour** $T - 2$ **to** $T - 1$: Spell check; reference check; verify cross-references (“see Fig. 3”, “see Eq. (12)”) resolve.
5. **Final hour**: Compile to PDF, verify rendering, check page numbers, name file according to contest convention.
6. **Submit with one hour to spare**. Never aim for the deadline. Internet failures during the final hour are routine.