

Teaching literature review in the age of Generative AI

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Content

- Why do we teach literature review
- What is the “Literature Research Project” (LRP) in the Department of Mechanical Engineering
- The advent of usable generative AI tools
- Challenges for LRP
- Changes to LRP to meet the challenges
- Outcomes

Why do we teach literature review?

- Imperial college Library website* states:

Key purpose of a literature review:

- *Provide context for your research*
 - *Demonstrate a knowledge of current literature in the field*
 - *In reviewing the literature it allows you to highlight any gaps in existing literature and Identify how your research fits in.*
- *i.e. you need to know where you are before you can make the next step!*
 - Message to students: “You are as likely to need to do literature research in a commercial environment as you are in academia.”

*Imperial College London, Library Services, Literature Review;

<https://www.imperial.ac.uk/admin-services/library/learning-support/information-and-research-skills/creating-and-communicating-information/literature-review/> Accessed on 24/04/2024

LRP in the Department of Mechanical Engineering (1)

- 5 ECTS
- Runs throughout Autumn Term
- 3rd year students carry out research of the literature on a topic of relevance to Mechanical Engineering
- Submit a written review describing the existing state of knowledge of that topic
- Supported by meetings with their supervisor
- Written and verbal receive feedback afterwards to help them in future literature review activities

Learning Outcomes for LRP in MechEng

- ✘ 1. Critique the overall state of knowledge on a topic of direct relevance to mechanical engineering
- ✓ 2. Summarise the ideas of others in original language and with full attribution in standard (e.g. Harvard) form
- ? 3. Differentiate between literature of reliable and unreliable provenance
- ? 4. Synthesise information from a wide range of sources, selecting key information to arrive at appropriate conclusions on a technical subject of relevance to Mechanical Engineering into a coherent written review

The advent of usable generative AI tools.

- November 2022: OpenAI released ChatGPT 3.5
 - ChatGPT could “theoretically” write whole documents with little input from students
 - As early as December 2022, the Department began to suspect that students had used generative AI for formal submissions
- An avalanche of large language models followed promising
 - Improved training data
 - Improved phraseology
 - Greater awareness of academic papers
 - Etc.

Responses

- From JISC primer on Generative AI in Education:

Strategy	Approach
Avoid	Revert to in-person exams where the use of AI isn't possible
Outrun	Devise an assessment that AI can't do.
Embrace and adapt	Embrace the use of AI, discuss the appropriate use of AI with students, and actively encourage its use to create authentic assessments

<https://nationalcentreforai.jiscinvolve.org/wp/2023/05/11/generative-ai-primer/#3>

Joint Information Systems Committee (JISC) is the UK digital, data and technology agency focused on tertiary education, research and innovation.

Learning Outcomes for LRP in MechEng with AI?

- ✗ 1. Critique the overall state of knowledge on a topic of direct relevance to mechanical engineering
- ✓ 2. Summarise the ideas of others in original language and with full attribution in standard (e.g. Harvard) form
- ? 3. Differentiate between literature of reliable and unreliable provenance
- ? 4. Synthesise information from a wide range of sources, selecting key information to arrive at appropriate conclusions on a technical subject of relevance to Mechanical Engineering into a coherent written review

Opportunities presented by Generative AI

- Generative AI is an opportunity for engineering education
- Students can use the tools to help:
 - Handle the “grunt work”
 - Structure their work
 - Understand the literature
 - Ease the writing process
- Clear message to students:
 - LRP is about engaging with the literature
 - Literature Research is about understanding the subject
 - Literature Review is about critical evaluation

Adjustments to the Literature Research Project for 2023-24

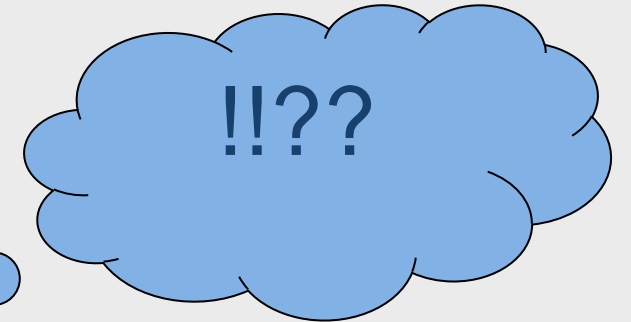
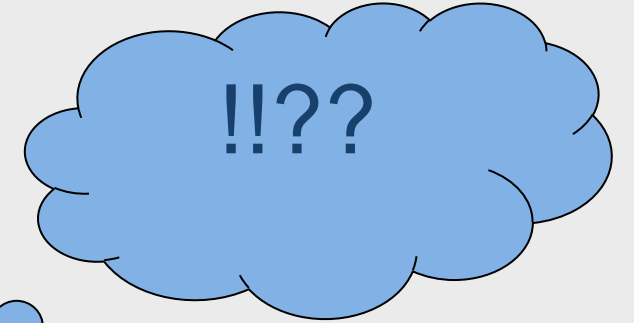
- Students were ***required*** to engage with AI
 - Reflections on use of AI were required in the report
- Clear focus on critical evaluation and understanding
 - Clear rubric specifying expectation and marks breakdown
- 4 Structured 1:1 meetings with supervisors
 - Clear expectations for students
 - Clear expectations for staff
 - Explicit feedback at the end of each session
 - Online app used to record and monitor progress
 - Encourages students to work steadily through the term

Planning

- Changes were communicated to MechEng staff during the Department's "Education Day"
- Specific expectations were highlighted to students
 - Demonstrate how the tools can be used
 - Defining "critical evaluation"!
 - Significant focus on "avoiding plagiarism"
- Development of a minimalist web app to record and monitor progress
- LRP 2023-24 started in October 2023

Outcomes of the Literature Research Project with AI

- No significant change in workload for staff
- No significant change in workload for students
- No significant change in marks distribution
 - Despite more stringent marking scheme
- No significant change in suspected plagiarism
 - Not related to AI – just the usual bad practice



Student reflections

- A sample of the students' reflections were reviewed.
- Despite the requirement, not all students engaged fully with AI
 - Many only followed the example given in the lecture!
- A range of tools was used
 - ChatGPT (3.5 most popular although some used 4.0)
 - Bard (Gemini)
 - Bing Chat (powered by ChatGPT)
 - SciSpace
 - Consensus
 - Elicit

Key messages to take forward

- AI is most useful when getting started on a review of literature and at the end when polishing the report
 - AI cannot identify holes in research (academic publications or its own training set)
 - AI cannot do critical review
 - AI can help understand complex concepts/papers but
- ... it requires oversight in all activities
- All information it provides must be fact checked
 - Summaries sometimes lose context and wander away from the topic
 - Any paraphrasing or rewriting must be checked against the original
- In depth research, critical review and analysis require human input and independent thought.

Staff survey

- 8 questions specific to the changes to the literature review project.
- 33 out of 56 supervisors replied
- Very positive response
- Generally agreed that:
 - The requirement to use AI helped students to recognise the benefits and limitations of these tools and how to use them more effectively.
 - The use of structured meetings encouraged students to understand critical evaluation and to work more steadily through the term.
- Response was not unanimously positive!
 - Many staff were concerned with the future development of generative AI
 - Many staff questioned whether the explicit literature research project is a good use of time!

Conclusion

- The Department followed advice to embrace generative AI
- Focussed on the things it cannot do well
- Students and staff were happy with the changes
- As a result of changes in response to AI, the learning outcomes were more comprehensively met.
- We must continue to monitor the development of these tools and adjust accordingly.

Questions?

ADDITIONAL INFORMATION

Structured meetings with your LRP students

- Four structured meetings as before.
- At each meeting:
 - Carry out the required tasks (see next slide + guidance document)
 - Discuss the students' use of AI tools
 - Discuss their progress
 - Record the discussion in the electronic meeting log (see Blackboard)
- 10% of the mark for LRP is assigned to Conduct of Task (*c.f.* DMT)
 - Mark only, after submission.
 - The discussion at the meetings **is** the feedback.
 - Additional justification will not be required.



Structured meetings with your supervisor

Meeting	Week	Content
1	2	<ul style="list-style-type: none">• Students give a review of both “starter papers”.• Discuss how to use these papers to find related papers.• Agree objectives.
2	5	<ul style="list-style-type: none">• Students provide two further papers and review them. Making connections between them and the two starter papers• Solidify objectives.
3	7	<ul style="list-style-type: none">• Students provide two further papers and review them. Making connections between them and the other literature identified.• Discuss structure of the report.
4	9	<ul style="list-style-type: none">• Discuss the reference list.• Solidify the structure of the report.• Specifically discuss the abstract.



Marking Breakdown

Abstract	10%
Coverage of topic (including background)	10%
Coherent explanation of key concepts to intended audience	20%
Evidence of critical review of the material	25%
Conclusions	10%
References (quality, relevance and citing)	15%
Reflection on the use of AI writing assistance	5%
Presentation (including structure, use of English etc).	5%



LRP 2023-24 Staff Survey Results

1. The following questions relate to the structured meetings with the students. For each statement, please assign a mark between +2 ("very much agree") to -2 ("very much disagree").

[More Details](#)

■ -2 ■ -1 ■ 0 ■ +1 ■ +2

The structured meetings helped to monitor students' progress?

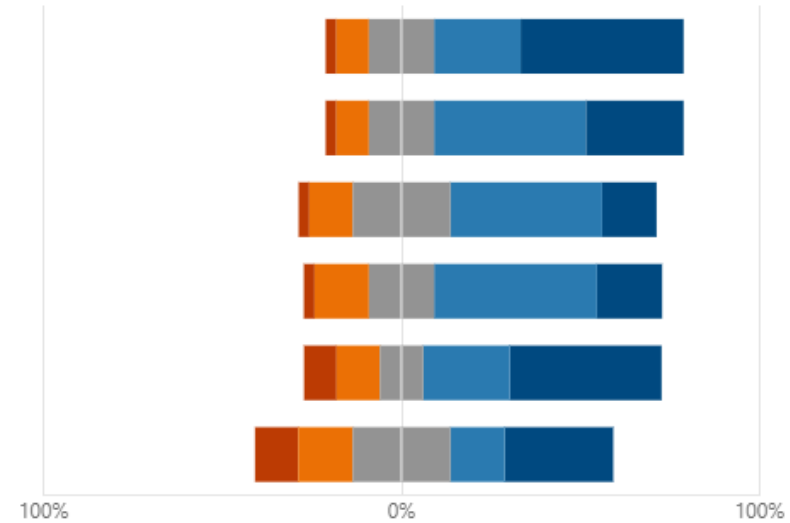
The structured meetings helped me to gauge the students's understanding of the subject matter.

The critical review of papers in structured meetings helped to improve the student's understanding of t...

The critical review of papers in the structured meetings helped to encourage students' critical...

The structured meetings helped to encourage students to work more steadily throughout the term.

The electronic log helped to review students' progress in each meeting.



2. The following questions relate to the use of generative AI

[More Details](#)

■ -2 ■ -1 ■ 0 ■ +1 ■ +2

Critically reviewing the use of Generative AI helped students to understand the value and limitations of...

LRP helped students to understand how to use generative AI in a productive way in the future, withi...

The students' critical review of their use of Generative AI helped my understand the use of such systems.

