Articles and their sections

in a bit more detail

and more on review, too…

What goes inside the building blocks of a scientific paper?

Introduction & Background

Motivation

- Why is the study relevant and important?
- Science for the sake of science is ok, but it isn't common in applied fields – make sure you are submitting to the right journal
- Some questions need not be asked (ethics!)

Background

- Collection of literature, reviewed and summarized
- What studies are relevant to your research question? Do they support it? Do they present a gap, or alternative view?
- Remember to connect the narrative thread!
- Reviewers are looking for what you missed, what you misunderstood.

Introduction & Background

Objectives

- Objectives are the most succinct description of the study
- Are not hypotheses!
- Specify the goal of applying your methods.

"Our objective was to determine the thermal transmittance of hemp fibre insulative panels treated with a fire retardant."

Hypotheses

- Should be stated in the form of null and alternative hypotheses (some journals may vary).
- Must have associated hypothesis testing methods and an appropriate experimental design.

H_0: There is no difference in the thermal transmittance raw hemp fibre panels and hemp fibre panels treated with fire retardant.

Materials & Methods

What did you do?

What did you use?

*Make sure a qualified researcher could replicate your study.

Materials and methods

Materials

- Define specimens in sufficient detail relevant to the topic
- Wood: species, dimensions, moisture content, grain angles, treatments
- Computer science: computational devices, IoT devices, sensors, data storage
- Surveys: questionnaires, protocols

Methods

- Testing methods
- Standards
- Procedures
- Analytical methods
  - Were assumptions met?
- Programmes, libraries, etc.

Results

What did you observe?

What were your
analytical outcomes?

Results

Observed results

- Point estimates (means, medians, modes)
- Variance (standard deviation, IQR)
- Data distributions
- Frequencies
- Figures and tables

Analytical results

- Data modeling outcomes
- Statistical analyses
- Hypothesis testing results
- Report effect sizes and confidence intervals
- Figures and tables

Discussion

What do the results mean?

Place results in context of other knowns.

How can we use this information?

Discussion

Meaning

- What do the results mean?
- Are the analytical outcomes (effect sizes) relevant in real terms?
- Do your outcomes have a meaningful effect for users? Industry? Policy makers?

Context

- Do your results align with previous experiments?
- How do your results compare with reference values?
- What new information has been provided?

Discussion

Use of information

- Who could use this information?

    - Other scientists, industry, policy makers?

- How is it useful for them?

    - Future research, product development, policy changes?

Conclusion

Brief restatement of what the study accomplished.

Key take aways.

Conclusions

Brief restatement of the study

"In this study we examined the insulative properties of hemp fibre panels with and without fire retardant. We found the U value of the fire retardant treated panels to be slightly, but not meaningfully lower than untreated hemp fibre panels."

Key points

"Despite slightly reduced insulative value, the safety increment is likely to provide significant market value to hemp fibre panels as the thermal resistance remains lower than the threshold required in most regions in Europe."

Optional

Future work

"Future work in this field should assess the differential environmental impact of fire retardant. Scale fire testing should also be conducted to ensure the fire performance increase warrants any increased environmental impact, cost, and decrease in insulative value."

Limitations

"The fire retardant used in this study is one of many. Other fire retardants may produce different results. Likewise, no product manufacturing parameters were altered to offset the effect of treatment on thermal transmittance."

More on review…

Review is important

Your next assignment will be to review your peers Literature Reviews

So we will go into a bit more detail:

- How reviews are initiated

- Determining if you should accept

- How much should you be reviewing

- Starting your review

- Providing useful feedback (to authors/editors)

How a review is initiated

After submission:

- Editor does a review for quality and relevance to the journal

- Editor sends passing articles to associate/section editors

- Assoc. editors read paper and determine potential reviewers
  - Either from their network or list of references

- Assoc. editors invite reviewers, give deadlines, other expectations

- Reviewers generally see just the abstract – must determine if they have time, have requisite knowledge to provide the review

Should you accept a review request?

Determining if you should accept

After receiving and invitation:

- Read the abstract to determine if it covers a topic you know well
  - Do you have some expertise in the topic?
  - Are the theories presented (if any) known?
  - Pay close attention to the methods, can you comment on their appropriateness and execution?
  - Are there other hints in the abstract that help you determine if you have some expertise?
  - Do you have time? Reviews (especially in the beginning) take 3 to 8 hours
  - You will likely be asked to provide a follow-up review

Starting & conducting your review

After accepting an invitation:

- You will get access to the full paper.

- The review process may include a short online questionnaire or specific questions to respond to in the review – have these in mind.

- First thing to check – alignment of theory, objectives, methodology, & results

- Second thing: are the conclusions supported by the evidence

- Third: is there sufficient detail to explain all the theory, methods, and results?

Conducting your review

Section by section:

- May be easiest to start with objectives and methods
  - **Big question**: can the methods support the objectives (and conclusions)?
    - If not: if the methods don't support the objectives, new methods or new objectives may be needed.
    - If hypothesis testing doesn't align with methods, the problem is larger. Topic for later.
  - **Big question**: Could you repeat the experiment/study with the information providing? What's missed?
  - Can you tell if the methods were properly applied? (Generally, we trust. If something big is missing that is relevant, ask for more information).
  - Human subjects involved? Should have ethics review (most of the time).

Conducting your review

Section by section:

- Introduction & background
  - Is the information presented relevant? (motivation, theory, connections)
  - Are previous studies appropriately represented?
    - (One way to determine if you should review is if you are likely to know the studies that will be cited.)
    - You should recognize some / most of the reviewed literature and be able to know if it is appropriately cited. You are often given access to databases you may not otherwise have during review to help find cited papers.
  - Is the theoretical background relevant to the motivation of the study?
  - Do the objectives follow the motivation and background?

Conducting your review

Section by section:

- Results
  - Do the results present enough information to objectively assess the application of the methods.
  - Look for observed data and analytical data. Are the appropriate for the methods and objectives? Do they advance the story?
  - Are the results sufficient evidence for the conclusions reached?
  - If results and discussion are presented separately, only explanations of the of the data and models should be given. Basic interpretation of analytic findings can be presented, but the discussion should carry the weight of "what the results mean".

Conducting your review

Section by section:

- Discussion
  - Keep an eye out for new material. Generally, no new literature, no new data.
  - Be mindful of exaggerated or over-cautious language
  - Be mindful of causal language
  - Is something missing? Have the points raised in the introduction been addressed?

Conducting your review

Section by section:

- Conclusions
    - Are the conclusions supported by the evidence?
    - Do the conclusions address the objectives?
    - Does it try to say too much? (content that should be in the discussion)

Conducting your review

Section by section (possibilities):

- Future work
  - Are there highlights of expanded, alternative or sequential investigations?
  - Is guidance given on how to proceed more effectively?

- Limitations
  - Are weaknesses pointed out?
  - Are solutions to overcome weaknesses presented?

How often to review?

- Review 2 to 3 times as many papers as you publish.

- Currently review is a service.

- Some publishers provide incentive (discounts on publishing charges, extended access to databases).

- Some reviewers are starting to complain about doing review for free, especially for big publishers.

Assignment 6: Review a peers lit review

- Review one classmate's lit review assignment.
- Be sure everyone completes a review and everyone get their paper reviewed.
- Answer a few to be provided in the assignment.
- Submit your review and provide it to the author.

- Due in 1 week.