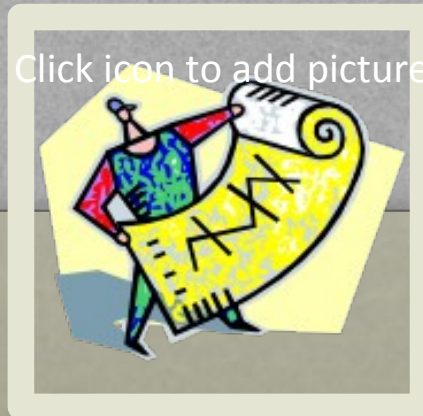


READING & EVALUATING SCIENTIFIC / TECHNICAL PAPERS



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Why Is This Important?

Good research is never done in a vacuum. When we are planning a study, we rely on:

- theory,
- previous research, and
- good ideas, and suggestions of our colleagues.

Being able to critically evaluate the published literature is an important part of doing research.

Reading an Article

The first thing we want to do when reading an article is to do a little informal discovery. What is the title? What kind of journal is publishing this article; is there anything special about the journal? What do we know about the authors? Who are they and where are they from? Are they senior researchers or are they just starting out?

The Title

- When we first start reading the literature in a specific area, we can learn a lot by paying attention to the little things. First, we want to look at the title. Is it fun/playful? Is it very formal and technical? Is there anything about the title that piques our curiosity?

The Journal

- Next, we look at the journal. Does the journal have a special mission that might influence how the research is presented? Is it sponsored by a scientific or technical association or institution? Is it a peer-reviewed journal; do all articles have to undergo a review process before they are published?

The Authors

Finally, we want to look at who wrote the article. We begin to build a body of personal knowledge about a field by paying attention to who is publishing what kind of studies and where they are located.

We can also learn about the authors by reading the "Author's Notes" in the article. These will tell us whether the study was funded by a grant, if there were other people who made important contributions to the study, and whether the research was student research satisfying requirements toward a degree.

We might be a little more forgiving if the article reports a master's or doctoral thesis than if it is published by a senior investigator.

The Abstract

Abstracts give us an overview of the study purpose, general research strategy, findings, and conclusions. They can be very helpful during a literature search. A good abstract gives us enough information to help us decide whether we want to read the entire article.

Practical exercise 1: Read the abstract and determine whether it includes each of the desired components?

- **Purpose**
- **Research Strategy/Design**
- **Findings**
- **Conclusion**

The Introduction

- The article's introduction provides an overview of the problem addressed by the research and specific study goals.
- The introduction also builds a rationale for the study by reviewing the relevant theoretical and empirical literature.
- The introduction also often ends with a summary of the research questions and/or hypotheses that guide the study.

The Introduction

Research Problem/Purpose

- Most researchers are studying a specific problem. This problem should be described very early in the article and be followed by a description of specific study goals.
- The statement of the problem and description of research goals give the reader an immediate sense of what the investigators are studying and why.
- A clear statement early in the introduction is a strength; no statement or one that is buried in the introduction would be a weakness.

Practical exercise 2 - read and identify

- **What problem is being studied?**
- **Is there a stated purpose or set of study goals?**

The Introduction Background Literature

- Should offer a clear argument for why the study being reported is necessary. It explains the origins of the research question.
- When evaluating the introduction, we read the description of the literature carefully and ask whether the literature cited provides good support for the study.
- We also look at the kind of support offered. Is there a theory that guides the research? Does this study build directly upon previous research? Is it important? Will it make a contribution to the field?

Practical exercise 3: Read the background literature carefully.

- 1. What kind of articles are described?**
- 2. Can you tell from the literature why the authors are doing this study?**
- 3. Is the study important?**

The Introduction

Research Question/Hypothesis

- Not all studies test hypotheses. Some areas of research are too new to warrant tests of hypotheses or the findings are so mixed that a specific hypothesis is not supported by the literature.
- It is not a weakness of the article if there is not a stated hypothesis. In the absence of a hypothesis, there should be an explicit research question/goal that is clearly outlined for the reader.
- The research question/hypothesis is usually presented at the end of the introduction and is accompanied by a rationale.

Practical exercise 4 - read and identify the answers to:

- **Does the research question/hypothesis follow logically from the literature review?**
- **Is there a clear rationale for the hypothesis?**

The Method / Approach

- The Method/Approach section of the article describes how the study was conducted.
- This section is rather lengthy because enough detail must be given to allow an interested reader to replicate the study.
- We read the Method/Approach section thoroughly and carefully in order to evaluate whether the study design/model is appropriate for answering the research question and meeting the study goals.
- When evaluating the study design/model, we examine the sample, the study design, specific procedures, and the measures used. We also consider how ethical issues were addressed if there is any.

The Method / Approach

SAMPLES

- A major consideration in all research is whether the investigators studied the kind of people necessary to answer the research question. The Method section should describe who was studied and how they were recruited.
- When evaluating the sample, we should ask whether the sample was appropriate for answering the question.

Practical exercise 5 – If sampling was used, identify

1. **Who was studied?**
2. **How were they selected?**
3. **Name the sampling strategy.**
4. **Is the sample appropriate; would you suspect that any bias was introduced into the study because of the sampling strategy?**

The Method / Approach

Procedures

- The Procedure section of an article describes how the study was implemented.
- From this description, we can identify the general research strategy and any controls introduced into the study to eliminate or minimize threats to validity.

Practical exercise 6 –

1. **What is the implementation procedure?**
2. **What controls were introduced into the study?**
3. **Was a manipulation check included, if so, what did it show?**
4. **Is the study design appropriate for answering the question?**

The Results

- The Results section describes the statistical analyses and their results.
- In this section we evaluate whether the appropriate statistics were used to test study hypotheses and whether the study findings are clearly presented.
- You should be able to summarize the results of statistical analyses and address whether the results adequately answer the research question.
- Tables and figures are also used to present study findings. These should be reviewed and evaluated as part of the presentation of findings.

The Results

Practical exercise 7 –

- 1. Was the statistic used to test the hypothesis appropriate for the scale of measurement and study design?**
- 2. Were the study findings clearly presented?**
- 3. Did the statistical test support or fail to support the study hypothesis?**
- 4. Did the figure effectively display the study results?**
- 5. Can the results be used to answer the research question?**

The Conclusions

- When presenting their research, investigators need to draw conclusions from the study findings and state their implications for the field. In addition, they should point out any limitations to their study.
- The Discussion section should begin with some discussion of whether the hypothesis was supported by the data. The conclusions should be placed in the larger literature. What do the study findings mean for theory? Do the findings agree or disagree with the existing research? What implications can we draw from this research? Are the findings important for the field? Finally, are there any limitations of the research? Do the authors adequately discuss these limitations?

CONCLUSIONS

Practical exercise 8 –

- 1. Did the authors offer a strong explanation of their findings?**
- 2. What do the study findings mean for theory?**
- 3. How do the study findings build upon previous research?**

Discussions

Implications

- A Discussion section should offer some general implications of study findings. Research should not only address issues interesting to a specific discipline, it should offer some benefit to society.
- Investigators should discuss how their findings can be used outside of the field of research.

Future Works

Limitations

- No study is perfect. Thus, in any evaluation, we must identify study limitations. Ideally, the authors have considered study limitations and present them in the Discussion section of their article.

Practical exercise 9 –

- 1. Did the authors present their view of study limitations?**

The References

- The reference section lists all publications cited in the article. It should be complete and in the appropriate publication style of the journal.
- It is helpful to review the reference list to obtain an overview of the researchers who are publishing in the field and the journals that publish similar articles. This may help you if you wish to pursue research in this area or conduct a larger literature review.

Summary

1. Evaluate how well the study accomplished the authors' goals and not your own.
2. Provide a balanced overview of strength and weaknesses.
3. Evaluate the technical aspects of the study and how well it is written.
4. Evaluate each component of the study before you pull it all together into an overall summary.