

EEES 3900 - Interpreting a scientific study – Questions to keep in mind

Is the study important?

Does the study contribute to what we already know?

In-depth information concerning this is usually found in the “Discussion” or “Conclusions” sections at the end of the report.

Look for answers to these questions:

Does the study answer a previously unaddressed question?

Does it address an old question in a new way or with surprising results?

Does it confirm the results of previous studies, strengthening the evidence or showing that the conclusion can be reached in multiple settings?

Does it build on past work to show trends over time?

Do the findings make sense?

The findings should be rooted in the existing body of research.

Proper references, with original sources for all factual statements and data from other research clearly cited.

Remember, just because a study’s findings challenge conventional wisdom, they are not necessarily incorrect.

It can lead to new insights and approaches.

Findings that go against the conventional wisdom, however, require more careful evaluation.

Who conducted the research and wrote the report?

Are the authors well regarded in the scientific community?

Have they published previously and, if so, in what journals?

Are the researchers independent, or could their work have been influenced by the company, government agency or advocacy group that employed or funded them?

Any potential conflict of interest should be identified up front.

What journal published the report?

An article published in a *peer-reviewed* journal has been evaluated by experts in the field to help ensure that it meets high scientific standards.

Each field has its own hierarchy of journals.

Sometimes you can look to the prestige of the journal as one indication of a study's quality.

What has changed since the information was collected?

A report should generally state in the abstract or summary when the information was collected.

Ideally, the data used in a study will have been collected recently so that the information reflects the current situation.

Are the methods appropriate to the research purpose?

To evaluate the findings properly, you should consider the method used in relation to the research question, and be aware of each method's advantages and disadvantages.

Does the study establish causation?

Often, the goal of a study is to determine the effect of something: for example, the effect of manure incorporation on the offsite movement of pathogens from an agricultural field.

Even if the study shows that a particular outcome occurred following incorporation, it can be difficult to prove that this treatment *caused* the outcome.

Is the time frame long enough to identify an impact?

Were enough samples analyzed over a long enough period of time? (longitudinal studies)

Be wary of "snapshot" studies that draw overarching conclusions from samples collected at a single moment in time. (cross-sectional studies)

Could the data be biased as a result of poor research design?

Were enough treatments tested? Was there adequate replication?

What were the controls, or reference treatments?

Are the results statistically significant?

When a quantitative study uses a sample (as opposed to surveying an entire population), it is important to determine mathematically that there is little probability the result could have occurred by chance.

In most sciences, a study finding generally is considered statistically significant if there is no more than a 5% probability that it could have occurred by chance.

Often expressed as a “p-value” of 0.05 or less.

Researchers should report on the results of all hypotheses, regardless of whether or not they reach statistical significance.

Statistical significance alone is not enough to prove cause and effect, but it lends credibility to an argument.

Statistical significance also does not necessarily mean an association has substantive significance; that is, it does not necessarily make a study finding *important*.