



# Al-Mustaql University

## College of Science



# Scientific Thinking and Research Skills

Third Year Students / 1<sup>st</sup> Semester

INTRODUCTION TO RESEARCH METHODOLOGY, *continued*

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*By*

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# Characteristics of Scientific Research -

## Accuracy & Confidence

- **Accuracy** refers to the closeness of the findings to reality ( e.g.  $g = 9.8 \text{ m/s}^2$ )
- **Confidence** refers to the probability that our estimations are correct.



# Characteristics of Scientific Research - **Objectivity**

Conclusions drawn from the analysis of data must be objective. It is proved from development of data and **Supported by the theoretical model.**



# Characteristics of Scientific Research -

## Generalizability

Scope of applicability:

- The wider, and better in the applicability,

For example (e. g.) [Rate Equation Model](#) applicable for lasers and fibre amplifiers systems.

### Rate equation modeling

by Dr. Rüdiger Paschotta

Rate equation modeling is a method of modeling the dynamics of laser gain media with differential equations for level populations.



# Characteristics of Scientific Research – **Thrift (cost-effective )**

1. The Fact is straight-forward.
2. Simplicity in explaining the phenomena or problem.
3. Assumptions are critical.
4. Minimize the dependent variables .



# High Quality Research

- It is based on the work of others.
- It can be replicated (duplicated).
- It is generalizable to other settings.
- It is based on some logical rationale and tied to theory.
- It is achievable!
- It generates new questions or is cyclical in nature.
- It is an apolitical activity that should be undertaken for the improvement of society.





# What is Bad Research?

- The opposites of what has been discussed.
- Looking for something when it simply is not to be found.
- Plagiarizing other people's work.
- Falsifying data to prove a point.
- Misrepresenting information and misleading participants.



# What Isn't Research

- Playing with technology (neglecting fundamentals)
- Book report.
- Programming project.
- Doing what others have already done.

**However, some of these points can be done as part of a research.**

# Questions ?



Thanks