The Ronald E. McNair Post-baccalaureate Achievement Program

New Jersey Institute of Technology

Objectives

1. **To Learn How to Perform Research**
   - **Work on an Open-Ended Problem.**
   - **No Two People will Approach the Problem in Exactly the Same Manner. The Approach to the Problem may be Similar but there will be Differences in the Solution.**
   - **There is more than One Answer to the Problem and this Answer will be. Dependent on the Assumptions Made.**
   - **No Two People will Approach the Problem with Exactly the Same Assumptions. Therefore, no Two People will get the Same Exact Answer.**
   - **The Assumptions may be Similar but not Exactly the Same. The Answers may be close and similar to Each Other but not Exactly the Same.**

Objectives (Continued)

2. **Learn How to Write a Technical Report and Subsequent Paper for Publication.**
3. **Learn How to Make an Oral Presentation.**

1. Topic

- **Introductions**
- **Introduction to Material to be Covered**

- **What is Research?**
- **What is Undergraduate Research?**
- **Discuss Your Research Proposal with your Advisor**
- **Describe your Research Plans to the Class.**

2. Topic

How to Write an Abstract

Assignment

- **Write an Abstract on your Research Project**
- **Present your Abstract to the Class for Critique**
- **Write an Abstract on an assigned paper in your field.**
- **Compare your abstract with that written by the author of the paper.**
- **Go to the Library, pick a journal in your field and read three papers and the related abstracts.**

2. Topic

- **Write a Biographical Sketch**

- **Prepare Biographical Sketch and work on abstract pertaining to your research study.**
- **Work in Groups of Two.**
- **Prepare Revisions and Submit Abstract and Biographical Sketch to the Program Director.**

3. Topic

- **Written and Oral Communications**

- **Discuss Written and Oral Communications from Manual.**

4. Topic

Data Procurement

Manual Contents

- Introduction
- Concepts for Correlations and Dimensional Analysis
- Laboratory Safety and Good Laboratory Practice
- The Laboratory Notebook
- Collection and Analysis of Experimental Data

5. Topic

- **Critique of Abstracts**

- **Presentation and Critique of Abstracts.**
- **Revise Abstracts and Submit Final Abstract to Dr. Perna with your Biographical Sketch.**

"Straight lecturing is the least effective way to improve student learning. Students tend to remember 10 to 50 % from "passive "involvement in the learning process

(we remember about 10 to, 50 % of what we read; 20% of what we hear: 30 % of what we see: and 50 % of what we hear and see)

Students remember 70 and 90 %, however, if they are "actively" involved

(we remember about 70 % of what we say and 90 % of what we say and do)

Also, students in learning environments where lecturing dominates become "rote" learners; Students learning in problem-based or cooperative learning environments become more "deep" learners.

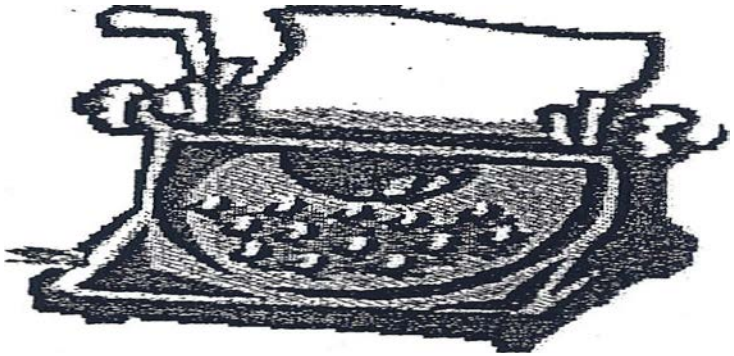
Professor Don Woods, Professor Emeritus,

Department of Chemical Engineering,

McMaster University, Hamilton, Ontario, Canada,

Publications Board Member,

Journal of Chemical Engineering Education



"One of the most outstanding faults, if one is looking for faults in the young men, is their inability to use the English language. The writing of simple reports and the expressing of themselves verbally seem to be two things in which they are notably deficient." (V.L. King, Technical Director, Calco Chemical and CO.)

“The most striking defect in the training of practically every man we employ is the lack of knowledge of English composition” – (Allan F. Odell deceased, formerly Chemical Director, Plastics Department, E.I. du Pont de Nemours and Co.)

"If I had to reduce all of educational psychology to just one principle, I would say this: The most important single factor influencing learning is what the learner already knows. Ascertain this and teach him accordingly".

David P. Ausubel
Graduate School and
University Center
City University of New York
"Educational Psychology
A Cognitive View"
Co-Authors
Joseph D. Novak
Cornell University
Helen Hanesian
Brooklyn College
1978

RESEARCH

The Ronald E. McNair Post-Baccalaureate Achievement Program

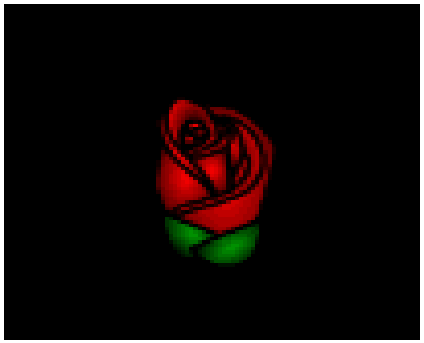
New Jersey Institute of Technology

Newark, New Jersey 07102

NJIT

New Jersey's Science & Technology University

Introduction



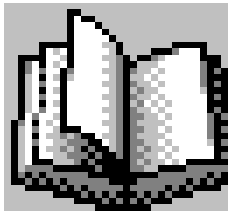
“A Rose is a Rose is a Rose”
Or

“Beauty is in the Eye of the Beholder”
Or
“Research is in the View of the Beholder”

What is Research?

“Research has been so loosely employed in everyday speech that few people have any idea of its real meaning”

“Practical Research”,7th Edition
Planning and Design,
Paul D. Leedy
Jeanne Ellis Ormrod



Dictionary

“Careful, systematic, patient study and investigation of some field of knowledge, undertaken to discover or establish facts or principles”

Leedy and Ormrod

What Research is Not

- Research is not information gathering
- Research is not mere transportation of facts from one location to another
- Research is not merely rummaging for information
- Research is not a catchword to get attention

What Research Is

"Research is the systematic process of collecting and analyzing information (data) in order to increase our understanding of the phenomenon about which we are concerned or interested"

1. Research originates with a question or problem

2. Research requires a clear articulation of a goal

3. Research follows a specific plan or procedure

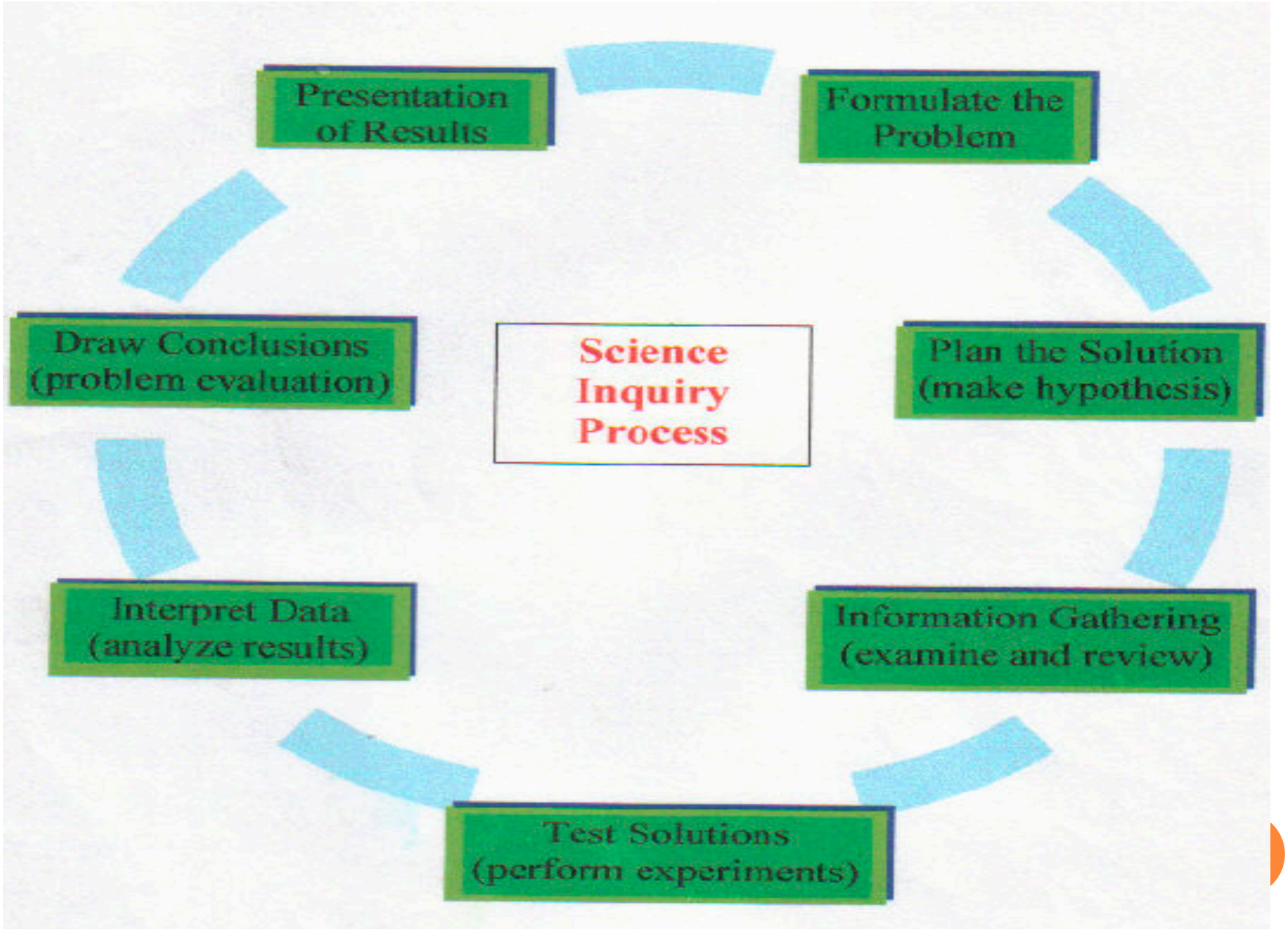
4. Research usually divides the principle problem into a more manageable set problems

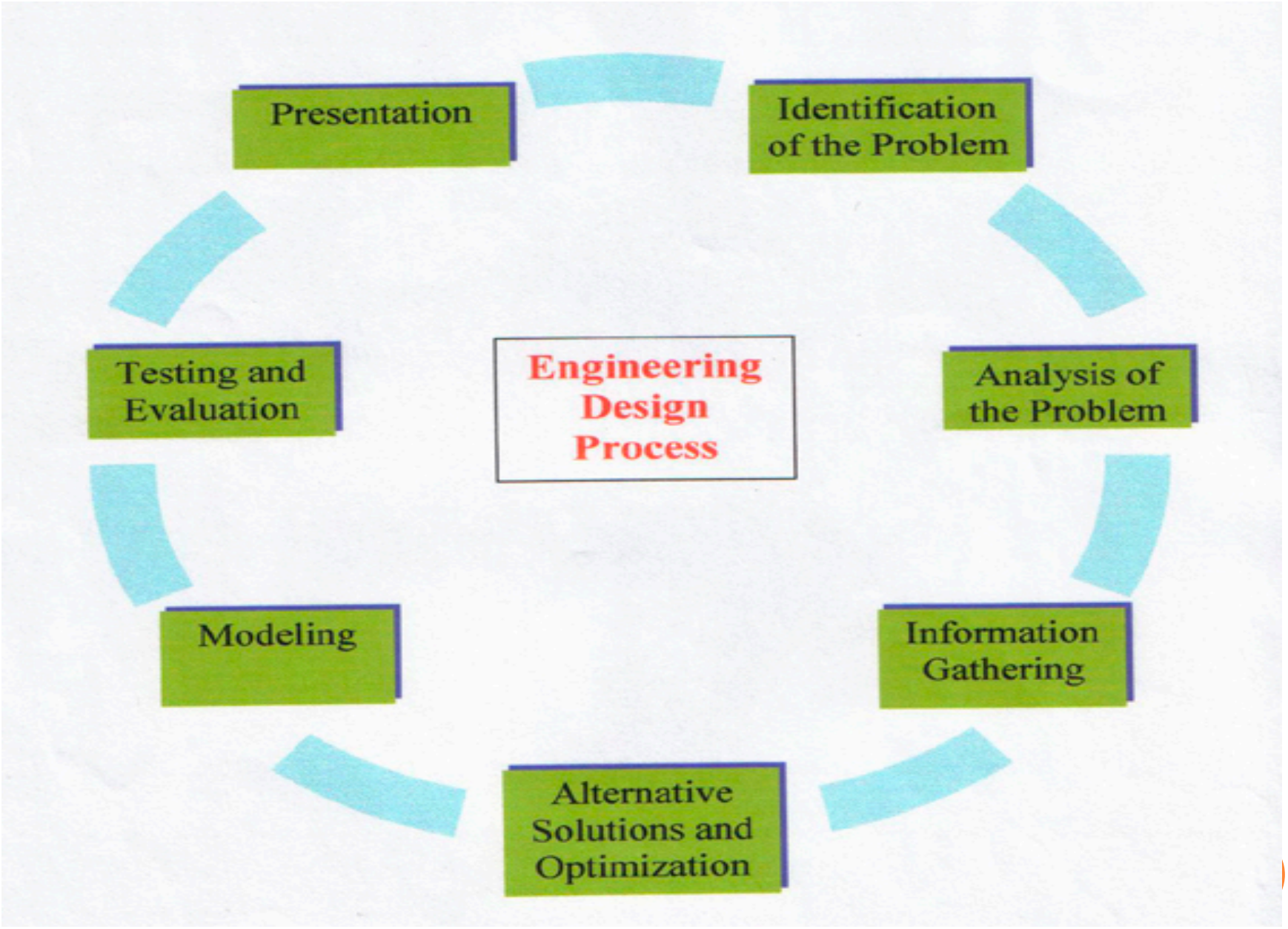
5. **Research is guided by the specific research problem, question or hypothesis**

6. **Research accepts certain critical assumptions**

7. **Research requires the collection and interpretation of data in an attempt to resolve the problem that initiated the research**

8. **Research is, by its nature, cyclical or more exactly helical**


Science Inquiry Process
Formulate the Problem
Plan the Solution (make hypothesis)
Information Gathering (examine and review)
Test Solutions (perform experiments)
Interpret Data (analyze results)
Draw Conclusions (problem evaluation)
Presentation of Results


Engineering Design Process
Identification of the Problem
Analysis of the Problem
Information Gathering
Alternative Solutions and Optimization
Modeling
Testing and Evaluation
Presentation

Research

- Graduate Research
- Undergraduate Research

Graduate Research

- Master of Science Dissertation
- Doctor of Philosophy or Doctor of Science Dissertation
  - Requirements for Degree

What is Undergraduate Research?

Judith A. Halstead,
Journal of Chemical Education,
Vol. 74, No 12, Dec 1997

After much discussion in a session sponsored by the Council of Undergraduate Research

"Undergraduate Research is an inquiry or investigation conducted by an Undergraduate that makes an original intellectual or creative contribution to the discipline"

What is Undergraduate Research at NJIT?

- **Undergraduate students engage in a year long or longer program of intensive study on an "open-ended" problem**
- **Student collaborates with a faculty mentor**
- **Undergraduate students are expected to present the results of their research study at Local and National professional meetings**

What is the Purpose of Undergraduate Research At NJIT?

- Undergraduates engage in a lengthy, detailed investigation with a faculty mentor
- Develop in writing an extensive report on their results and make oral presentations about their study
- Ignite interest in research and, hence, Graduate School, a PhD and hopefully enter into academia

What is the Benefit to Student

Undergraduate Students

- **Gain an Insight into the Research Process**
- **Undergraduate Students Gain an Insight into Graduate School**
- **Undergraduates Gain an Insight into Teaching in Academia**

Pathways to Undergraduate Research

- **Curriculum**
- **Special Programs**
  - **University Research Experience (URE)**
  - **The Ronald E. McNair Post-baccalaureate Achievement Program**
    - **Recruit Qualified Students from Underrepresented Groups**
    - **Introduce them to the Challenges Associated with Research**

Undergraduate Research

- **Can lead to course credit for an elective**
- **Not a requirement for degree**

QUESTIONS
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THE END