My views and Advice on
TEACHING, RESEARCH, AND SERVICE

J. N. Reddy
(a series of lectures presented in the Mechanical Engineering Department at Texas A&M University)

*** DISCLAIMER ***

What I say here only reflects my personal views on teaching, research, and professional service aspects of being a faculty member.

I will be speaking on these topics from my own experience as a university faculty member for about 45 years.

What I say does not represent necessarily the views of the university I serve or colleagues around the world (although most are likely to agree with the views expressed and advice given).

Also, attendance at this meeting is optional but the participation may help the attendees professionally.
I have reached an age where my train of thought often leaves the station without me. So, please be sure to remind or ask me if I left something not addressed during my presentation.
We must manage our time in such a way that we balance our life by taking care of our obligations to family, profession, and society. (The order is different on different days)
TOPICS TO BE DISCUSSED

• Teaching/Education
• Research (investigation/study, dissemination of results, and sponsorship)
• Professional Service
Facilitating learning and imparting knowledge and skills (creative thinking)

- Be interested in (and passionate about) students’ learning the material you teach.
- Handout in the first class should provide the objective of the course and information on the textbook used, material to be covered, homework to be assigned, tests and quizzes to be given, grading policy, and office hours. It is not a good idea to change these during the course.
TEACHING (continued)

- Prepare your lectures – every lecture and every time you teach.
- Relate to *common-sense* thinking and to material covered in courses already taken by the students.
- Be open and fair in your evaluations.
- Allow sufficient time for questions and office visits.
- Discourage and avoid giving make-ups.
- Giving too much help *may* earn you high evaluations but it is not an effective teaching.
Knowledge is understanding of something, such as facts, information, descriptions, or skills - which is acquired through education by perceiving, discovering, and learning.

- Treat students with respect – the way you would treat a colleague.
- Teach your graduate students the art and skills of teaching, investigation, proposal writing, and inter-personnel skills.
- Be a role model as a teacher, researcher, and service person.
SETTING UP THE TESTS

- Let the students know what you expect them to be prepared for
- State the rules of test taking
- Be clear and unambiguous in stating the question (give all necessary information needed to answer questions)
- Prepare the solution to make sure that everything is stated correctly and to gauge the time required to complete the test.
EXPERIENCES AS A TEACHER (humorous but real)

Peter

\[ (a+b)^n = (a + b)^n \]

2

\[ a^2 - b^2 \]

\[ = (a - b)(a + b) \]

\[ etc. \]
It’s curvy, with a higher bit at the end a rather aesthetically pleasing slope downwards towards a pretty flat strait bit. The actual graph itself consists of 2 strait lines meeting at the lower left corner of the graph and moving away at a 90° angle. Each line has an arrow head on the end.
Q. If I am travelling at 100 feet/second in a car and the speed limit is 65 miles per hour, am I speeding? How far will I travel (to the nearest mile) in 3 hours at this rate of speed?

Response:

Look at the speedometer asshole!
Explain why the concentration of sulfate ions increases in the electrolyte.
3. Name an angle complimentary to BDC:

You look much thinner from over here.
Research can be defined as the search for knowledge, or as any systematic investigation, with an open mind, to establish novel facts, solve new or existing problems, prove new ideas, or develop new theories.

The primary purposes of basic research (as opposed to applied research) are documentation, discovery, interpretation, or the research and development of methods and systems for the advancement of human knowledge.
Knowing the fundamentals associated with each field not only makes one a better engineer/scientist but empowers one to create and disseminate knowledge.
Engineering is a problem-solving discipline. What engineers do is to solve problems for human safety and comfort.

Both medical practice and engineering are problem-solving disciplines, and both require an understanding of complex systems and phenomena that occurs in the systems.
Engineering vs. Medicine

Engineering design processes are based upon predicted outcomes. Engineering solutions require the satisfaction of numerous criteria simultaneously. Those solutions often require sophisticated mathematical models, analysis techniques, and experiments to validate. By contrast, medical practice uses an approach that combines diagnosis and empiricism; that is, physicians use various tests to diagnose a medical condition and plan a treatment based on empirical data and professional experience. Generally, medical practice precludes any formal process to predict the outcome of a treatment.
One of the most important things engineers and scientists do is to *model physical Phenomena*. Modeling the phenomena involves

- Mathematical Models
- Analysis Methods
- Physical Experiments
- Design & Manufacturing
In response to global market needs, our engineers need to

- Possess multi-disciplinary knowledge and skills
- Innovative and creative
- Enterprising leadership
- Independent learner and worker
- Possess an global outlook
RESEARCH

Scholarship: The systematized knowledge of a learned person, exhibiting (1) accuracy, (2) critical ability, and (3) thoroughness.

- Keep the long-term objectives in mind.
- Focus in specific area that is not saturated. – so that you can become a leader in the area.
- Conduct research to publish and seek sponsorship/funding.
- Organize your time around teaching and service to do research – not postpone it.
INVENTING AND CREATIVITY

- An invention may be derived from a pre-existing model or idea, or it could be independently conceived.
- Inventions often extend the boundaries of human knowledge or experience.
- An invention is a creative process. An open and curious mind enables one to see beyond what is known.

“Imagination is more important than knowledge.”

Albert Einstein
Given this \[ \frac{8}{0} = \infty \]
tell me \[ \frac{5}{0} = ? \]

A child (< 3yr old) who gives this answer is creative, because the child recognized the structure in the statement given.
In life, we will have many opportunities to be creative!

JN Reddy
You can also be creative in day-to-day things we do
If you do not think ...
MENTORING STUDENTS Through Research

Teach your students the art and skills of

- investigation,
- communication,
- technical writing,
- proposal preparation, and
- inter-personnel skills.

JN Reddy
COLLABORATIONS

- Within the department, across the college, across the university, and outside
- Need based –
- Complementary background/experience
- Strengthen the proposal
- Do not work for someone; work with others
- Do not collaborate to please someone and get his/her support for something you want to gain (it is politics !)
Academic culture (especially in the USA) is such that faculty members are required to seek research sponsorship to support their students and themselves (for example, summer salary, equipment, and travel). This is now being followed by most nations.
PROPOSAL WRITING

- What is it that you are proposing to do?
- Why is it important to do?
- How and Why - How does your proposed work differ from reported (or existing) work, and why is yours worthy of support?
PROPOSAL TITLE and ABSTRACT

- Tickler (get attention to a topic)
- Concept (statement)
- Findings (right and wrong)
PROPOSAL WRITING (continued)

- Read and follow the requirements of a proposal (e.g., number of pages, dollar amounts, cost-sharing, etc.)
- Preliminary contact with funding Agencies (to know other factors that are considered in evaluating the proposals)
- Never ‘over-do-it’ to turn the reviewer off
- Keep things in perspective (teaching and student advising, personal involvement in research, professional goals and objectives)
THINGS REVIEWERS LOOK FOR IN A PROPOSAL

► Proposes Research
  ▶ Originality
  ▶ Clarity

► Motivation for the Proposed Research
  ▶ Background
  ▶ Summary of the state-of-the-art
  ▶ Paragraph leading to the proposed research

► Technical Know-how
  ▶ Why it should be done
  ▶ What is special about your proposed work
  ▶ Preliminary results
  ▶ Significance and impact
All engineers must present their work to others:

- Superiors
- Peers
- Public

Engineers are results-oriented people, and reports/papers are how results are communicated.

Some reports are formal and most are informal; journal papers are all formal.
Journal publications are very important.
Publish in journals with good standing.
Review articles are cited more often.
Conference papers should be expanded and published as soon as they are presented.
Books take lots of time and require certain level of professional maturity.
EFFECTIVE TECHNICAL WRITING

- EFFECTIVE WRITING IS:
  - Choice of words
  - Artful combination of words
  - Straightforward, unambiguous phrasing
  - Non-distracting phrasing
  - Above all - communication of ideas

- We want to discover the art of writing and obey the rules of grammar
CHARACTERISTICS OF GOOD WRITING

- Clarity - be readily understood
- Conciseness - don’t waste words
- Effectiveness - be efficiently understood
- Preciseness - state without ambiguity
PROBLEMS IN WRITING

► Distracting/Frustrating the reader:
  • Grammar mistakes and spelling errors
  • Awkward sentence construction
  • Technical errors and omission of data

► Not saying what you mean:
  • Use of ambiguous words
  • Indefinite references

► Confusing the reader by:
  • Poor organization
SERVICE

- Feeling of giving without the expectation of return
- Feel responsible
- Obligation to the institution, profession, and the society
SERVICE (continued)

- Serving the department
- Serving the College
- Serving the University
- Serving the professional community
- Serving the society
SERVICE WITHIN THE UNIVERSITY

- Committees in the department
- Committees in the College
- University committees
SERVICE TO THE PROFESSION

- Review of journal manuscripts
- Proposal reviews or serving on panels
- Serve on Professional/Technical Committees (State/National/Int.)
- Organize sessions, symposia, and conferences
- Memberships on editorial boards of journals in your areas of expertise.
OUTSIDE SERVICE

- Service to the community (society, country)
- Help local schools with your technical background
CLOSING COMMENTS

- Manage your time between different responsibilities in life (family, job, and profession).

- Be passionate about teaching and research and devote sufficient time to them. Say ‘no’ to certain professional service requests when your plate is full. Do not always think of ‘what is in for me’.

- ‘Working hard’ and ‘hardly working’ are not the true measures of your performance. WD=F × D is the measure.

- Serve your institution, your profession, and your community with a feeling of responsibility and without the expectation of return.
THERE IS SO MUCH TO DO
AND SO LITTLE TIME WE HAVE

That which is not given is lost
I thank you for your interest in attending my presentation.
About the Author

Dr. J.N. Reddy is a Distinguished Professor, Regents’ Professor, and inaugural holder of the Oscar S. Wyatt Endowed Chair in Mechanical Engineering at Texas A&M University. He is an author and coauthor of over 500 journal publications and 19 text books.

Dr. Reddy is one of the original top 100 ISI Highly Cited Researchers in Engineering around world with over 18,250 citations with h-index of over 63 as per Web of Science, 2015; as per Google Scholar, the number of citations is over 43,300 with h-index of 85 and i10-index of 389.

Dr. Reddy has numerous significant honors and awards. He is a member of the US National Academy of Engineering; he was recognized for “contributions to composite structures and to engineering education and practice.”