



Al-Mustaql University

College of Science



Scientific Thinking and Research Skills

Third Year Students / 1st Semester

Research skills, continued

2025-2026

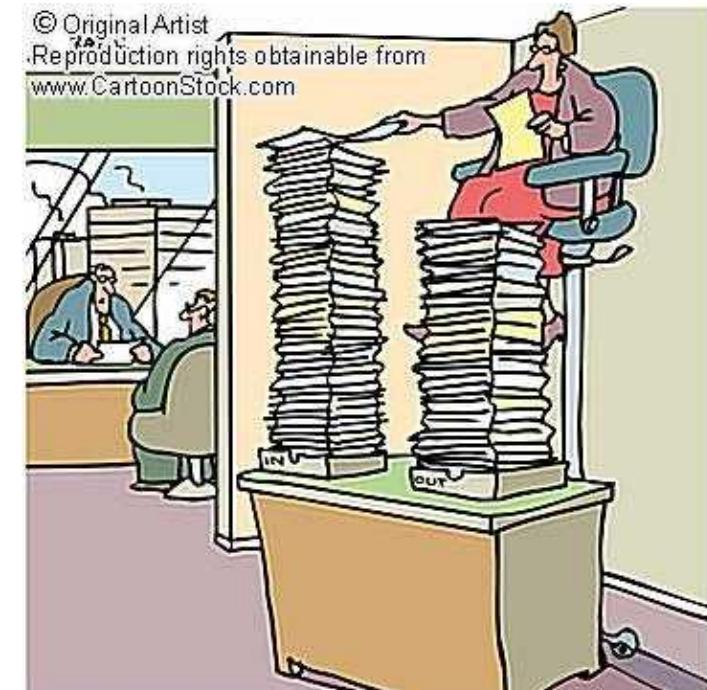
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By

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Skill 7: Problem solving and adaptability

- Find suitable tools to answer a question or to solve a well-posed problem
- Be able to **adapt** yourself to the context
 - Turn a problematic situation into an interesting research problem
- Read, read, read
- Don't get discouraged, a solution can always be found



"We look for people who can quickly adapt to changes in the workplace."

Skill 8: Self-critical eye

- If you are too sure of your research results, you will never notice the flaws
- If you are too unsure, you will never start
- Flaws should be considered and noted, they may be useful later to modify the theory to make space for them
 - This can be a source of great results
- Have your work read by others and listen to the comments and suggestions
 - Humbleness: there is always something you can learn from others



Skill 9: Being able to learn lessons

- A system or a tool may be a useful object, and experiments may be good, but what is most important is the general lesson learnt by developing it
 - Others (or yourself) can use this lesson to build different tools or to define other experiments
- Same also for a theorem, but less crucial since a theorem is already a way to abstract and generalize what has been seen in a specific case
- Learn also from failures (or from rejected papers)
- **Work locally, think globally**
 - Work hard on your specific propagator, but think about the general consequences of your results



LEARN

Skill 10: Independence and courage

- Independent thoughts
 - Not just following others' ideas
- Courage to pursue your ideas
 - Self-confidence
 - Also courage to know when to stop
- Don't worry to state your ideas and to be criticised
- Better to be criticised than to be ignored
- No need for people who follow others



Skill 11: Communicating your results

- A paper
- A talk
- A Ph.D. thesis
- General advice:
 - The idea and motivation is important, not just the technical details
 - The simpler your way to present your idea, the more chances people will pay attention



Skill 12: Participate in the academic system

- Write a review
 - Reviewers are there to help science go forward, just like authors
 - ... not to help their papers by killing others!
- Ethics
 - The most important asset of a researcher is his reputation
 - Freedom in what to do, but we need to have high ethical standards
 - Honesty
- Have a good attitude!
 - The advancement of science is a distributed collaborative effort



General advice 1: Work hard

- Given two people with equal abilities, the one who works 10% more will produce twice as much
- The more you know, the more (and faster) you learn, the more you can do



General advice 2: Drive and commitment

- You should be committed to your research
- This is not a 9 to 5 job
- It should not be a sacrifice, but an opportunity to do something you enjoy



General advice 3: Openness to other people

- Be open to others and to others' work
- Read a lot
- Talk a lot with other people
- Open vs. closed office doors
 - People who work with a closed door produce more in the short term but obtain less, and less interesting results, in the long term



General advice 4: Collaboration

- Most great work comes out of collaborations with others
- More than one point of view
- Faster definition of the problem
- Solving eased by resorting to more available techniques
- More fun



General advice 5: Be open to many diverse experiences

- Take different courses
- Go to summer schools and conferences
- Spend periods in industry or other labs
- One never knows what can come out
- Never a waste of time!



Summary

- Many research skills
- You can learn/improve your research skills
- You can produce sustained great research results if you are committed, open, enthusiastic, honest
- Work hard and enjoy what you do



Some useful sources

- **You and your research**, R. Hamming
- **Technology and courage**, I. Sutherland
- **Basic research skills in computing science**, C. Johnson
- **What is research in computing science?**, C. Johnson
- **How to give a good research talk**, S. L. Peyton Jones, J. Hughes, J. Launchbury
- **How to write a good research paper**, S. Peyton Jones
- **How to organize your thesis**, J. W. Chinnek
- **How to have a bad career in research/academia**, D.A. Patterson
- **Ethical constraints**, Toby Walsh