

Research Methods

comp4809/7809

Week 1 Summary

- The project is a transition to research
 - Know what is expected (look at the marking criteria sheets)
 - Develop your research skills
- Plan the timeline for the YEAR
 - You set the agenda for yourself, schedule your weekly timetable, and manage the relationship with your supervisor

Chocolate Frog Initiative Awards

- First to notify about a wiki problem
- First to add a title section to the wiki

Review of Week 1

- Getting started – how did it go?
 - Progress on (a) project and (b) project skills
- Time management 101
 - Make the timetable work for you
- About the Deliverables
 - Deadlines
 - Extensions
 - Make them work for you

Make the deliverables work for you

1. DON'T PANIC
2. Ask for extensions when you need them via email kaiw@itee.uq.edu.au
3. Seek help from the newsgroup uq.itee.comp4809
4. Submit Deliverables early (and often)

Email

- Send email from your student account
- Dear Prof Wiles or Hi Janet
- Dear Kai
- Sign with your full name and student number

Deliverables

- Name and student number on every submission
- use pdf format
- 1 file per submission

Week 2.

- Move your focus to the tasks that are on your critical path

Deliverable #2.

Annotated bibliography

- We use words every day.
- Why is it so hard to explain technical material clearly?

Deliverable #2:

Annotated Bibliography

- List 5 appropriately formatted references relevant to your project using endnote. At least three must be *peer reviewed* papers.
- What counts as peer review?
 - Journals and fully refereed conferences
 - Why are wikipedia articles not acceptable?
- Reference formats
 - Use a style sheet: endnote or bibtex
 - IEEE Computer Society style guide <http://www.computer.org/author/style/refer.htm>
 - APA style (for psychology formats) <http://www.apastyle.org/>

Attendance sheet

Week 2.

- Referencing vs. plagiarism
- Referencing formats (redux)
- What's in a Literature Review?
- Time management

What's the most common reason why students at UQ fail their project?

Referencing vs plagiarism

How you refer to your references matters

- Plagiarism is using words and ideas without properly crediting the author
- Intentional or unintentional are both prohibited.

How you refer to your references matters

- Case 1: A student used an online summarizing program to compile their literature review. It directly copied wikipedia.
The student got zero for that component.
- Case 2: A student made notes from an article, some of them directly using the author's own words, but didn't separate their own words from the original words.
The student got zero for that component.

How you refer to your references matters

- Cases 1 and 2 were lucky that they were caught early
- Case 3: A student copied the bulk of a thesis report. It wasn't caught until the work was published much later with the supervisor.
The student was stripped of their degree and the supervisor demoted.

Taking appropriate notes helps you avoid unintentional plagiarism

- Take good notes from articles you read so that you
 - Have access to the ideas later
 - Know the right use of professional terms
 - Know the source of your ideas
 - Don't have to look back later
 - Don't inadvertently plagiarise

What's plagiarised in this paragraph?

What other errors are there?

- Homologous genes were a surprise to evolutionary theorists. Although it is said that what is true for *ecoli* is also true for the elephant, it was the general principle of regulation by switches, rather than the actual switches themselves that was expected to be true across organisms.

Exact quote
Spelling
Ref needed

Revised

Note the use of quotation marks “ ”, correct spelling, original names (Monod, Mayr), the citing authority (Carroll), dates and page numbers.

- Homologous genes were a surprise to evolutionary theorists. Although J. Monod in the 1960s quipped “What is true for *E. coli* is also true for the elephant.” (quoted in Carroll 2005 p. 60), it was the general principle of regulation by switches, rather than the actual switches themselves that was expected to be true across organisms. For example, the great evolutionary biologist, Ernst Mayr wrote that “the search for homologous genes is quite futile except in very close relatives” (quoted in Carroll 2005 p. 71).

Citing other people's ideas and words

- Facts and ideas must be followed by the source
 - e.g., Genes share switches (Carroll, 2005).
 - All facts and ideas need references
- Exact reuse of words should be in quotes
 - e.g., “What is true for *E. coli* is also true for the elephant.”
 - Give the original writer, the citing authority and page number (quoted in Carroll 2005 p. 60).
 - More than five consecutive words needs quote marks
 - More than ~40 words needs paraphrasing or writing to the copyright holder for permission

Taking notes while reading literature

- Words
 - Spell technical words and authors' names correctly from the beginning
 - Learn to pronounce the names
 - Learn the right format *E. coli* (not *ecoli*)
- Quotes and ideas
 - In your notes, distinguish between quotes and paraphrases
 - Keep records of all sources of ideas and also page numbers for quotes.

Example: Take notes that distinguish original words and ideas from your own paraphrases

- Carroll (2005 p. 33) on Williston's Law, noted "in the course of evolution, earlier groups tended to have large numbers of similar serially reiterated parts, but that later groups exhibited reduced numbers and specialized forms of these structures." Eg digits in tetrapods started with up to eight per foot, but only five types.

Reference Formats

- IEEE
- American Psychological Association (APA)
- Examples are on the wiki

<http://www.itee.uq.edu.au/~comp4809/wiki>

Journal articles

Find the
errors

Belew, R.K.

Rik Belew, (1990). Evolution, learning and culture:
computational metaphors for adaptive search.
Complex Systems, 4(1):11-49.

Nishikimi, M., Fukuyama, R., Minoshoma, S., Shimizu,
N., and Yagi, K. (1994). Cloning and chromosomal
mapping of the human nonfunctional gene for L-
gulono-gamma-lactone oxidase, the enzyme for L-
ascorbic acid biosynthesis missing in man. *Journal of
Biological Chemistry*. 269: 13685-8

Books

**Find the
errors**

Cohen, J. and Stewart, I. (1994). *The Collapse of Chaos.*

London: Penguin

Mitchell

~~Mitchell~~, M. (1996). *An Introduction to Genetic Algorithms.* Cambridge, MA: MIT Press.

Edited book

Turney, P., Whitley, D., and Anderson, R. (1996).
*Evolution, Learning and Instinct: 100 Years of the
Baldwin Effect*, (Eds). Cambridge, MA: MIT Press.

Conference Proceedings

French, R.M. and Messinger, A. (1994). Genes, Phenotypes and the Baldwin Effect: Learning and Evolution in a Simulated Population. In R. Brooks and P. Maes (Eds.), ~~Artificial Life IV~~. Cambridge, MA: MIT Press. *Artificial Life IV* *Page numbers?*

Mayley, G. (1996). The evolutionary cost of learning. In (Eds) P. Maes, M. J. Mataric, Jean-Arcady Meyer, J. Pollack and S. W. Wilson, *From Animals to Animats 4: Proceedings of the Fourth International Conference on Simulation of Adaptive Behavior*. Cambridge, Ma: MIT Press, 458-467.

Different formats are used for referencing different types of articles

- Journal
- Book
- Edited book
- Book chapter
- Reproduced article
- Conference Proceedings

Journals, books, edited book, book chapters, conference proceedings, reproduced articles

Journal

- Belew, R.K. (1990). Evolution, learning and culture: computational metaphors for adaptive search. *Complex Systems*, 4(1):11-49.
- Nishikimi, M., Fukuyama, R., Minoshoma, S., Shimizu, N., and Yagi, K. (1994) Cloning and chromosomal mapping of the human nonfunctional gene for L-gulonogamma-lactone oxidase, the enzyme for L-ascorbic acid biosynthesis missing in man. *Journal of Biological Chemistry* 269, 13685-8.

Book

- Cohen, J. and Stewart, I. (1994). *The Collapse of Chaos*. London: Penguin.
- Mitchell, M. (1996). *An Introduction to Genetic Algorithms*. Cambridge, MA: MIT Press.

Edited book

- Turney, P., Whitley, D., and Anderson, R. (1996). *Evolution, Learning and Instinct: 100 Years of the Baldwin Effect*, (Eds). Cambridge, MA: MIT Press.

Book chapter

- Deacon, T. W. (2003). Multilevel selection in a complex adaptive system: the problem of language origins. B. H. Weber & D. J. Depew (eds.) *Evolution and Learning: The Baldwin Effect Reconsidered*. Cambridge, MA: MIT Press.

Reproduced article

- Baldwin, J. M. (1896). A new factor in evolution. *American Naturalist* 30: 441 – 451. Reproduced in (eds.) Belew, R.K. & Mitchell, M., *Adaptive Individuals in Evolving Populations*, Proceedings Volume XXVI, Santa Fe Institute Studies in the Sciences of Complexity. 1996. Reading, MA: Addison-Wesley.

Conference Proceedings

- French, R.M. and Messinger, A. (1994). *Genes, Phenotypes and the Baldwin Effect: Learning and Evolution in a Simulated Population*. In R. Brooks and P. Maes (Eds.), *Artificial Life IV*. Cambridge, MA: MIT Press.
- Mayley, G. (1996). The evolutionary cost of learning. In (Eds) P. Maes, M. J. Mataric, Jean-Arcady Meyer, J. Pollack and S. W. Wilson, *From Animals to Animats 4: Proceedings of the Fourth International Conference on Simulation of Adaptive Behavior*. Cambridge, Mass: MIT Press, 458-467.

Literature Review

- Definition
- What's in a literature review?
- Finding research literature
- Reading with a sensible approach
- Keeping good records
- Where to put the literature review?

Definition: Literature review

- A literature review sets out the major themes in the paper, showing how they relate to previously published results.
- e.g., a precise analysis of previous work could explain what methods have been proposed and tested, how they are similar and where they differ, and compare their relative strengths and weaknesses.

What's in a Literature Review?

- What literature?
 - Peer reviewed research
 - Relevant studies
- Two aspects:
 - Facts that are widely known in the field (found in text books, manuals, documentation)
 - Studies that have been done to investigate your issue or that have a bearing on your research

Review both content and methods

- Domain-specific methods
 - Tools & techniques
 - Methodology
 - Analysis techniques
- Content
 - Major issues
 - Theorems, conjectures
 - definitions

Finding research literature

(list adapted from Zobel 2004 pp163-165)

- Finding relevant published work requires broad systematic effort:
 - Use citation indices, (e.g., citeseer.com) and search engines (e.g., scholar.google.com)
 - Search online archives, digital libraries (e.g., IEEE, Springer)
 - Browse recent issues of relevant journals and conferences
 - Web sites of active groups and researchers
 - Conference web sites
 - Discuss your work with a wide range of people

Reading with a sensible approach

“Critical” when used to describe reading literature does not mean “criticising” or “looking for faults”. It comes from the practice of “critiquing” or giving insightful comments.

- Use your judgement when reading
 - Or, if you are new to research, develop your sense of judgement
- Don't be too trusting
 - Refereeing helps to ascertain quality, but it is not a guarantee
 - You still need to read critically
 - Some research is just plain inaccurate or misguided
- Don't be too dismissive or too narrow
 - Few papers or research studies are perfect. That doesn't make them useless
 - Good papers have both strengths and weaknesses

Questions to ask yourself to help develop your sense of judgement

As you read, actively try to identify contributions and shortcomings of a paper.

- “What are the main results?”
- How precise are the claims?
- How could the outcomes be used?
- What is the evidence?
- How was the evidence gathered?
- How were measurements taken?
- How carefully are the algorithms and experiments described?
- Why is the paper trustworthy?
- Has the right background literature been discussed?
- What would reproduction of the results involve?”

(Quoted from Zobel, 2004, p. 167)

Keeping good records

- Literature
 - Reference list
 - Annotated bibliography (D2)
 - Exact quotes with citation info (source info, page no's)
- Log book or file (List adapted from Zobel 2004 p. 151)
 - Meetings: written notes, email/blog record, wiki notes
 - Decisions, Ideas, Expectations of outcomes
 - Definitions, descriptions of methods
 - Algorithms, pseudocode, code versions
 - Theorems, experiments, outcomes

Where to put the literature review in the project report?

Three different locations are possible:

1. Early (in the intro)
 - Used in most disciplines to set the context for the research
 - Use this option unless explicitly told otherwise
2. In each section where the information is used
 - Occasionally used where methodology is the major contribution of the research
3. After the results (in the discussion section)
 - Often used in maths
 - Give the hypothesis and proof first, then discuss it in relation to the rest of the literature.

A Tale of Two early drafts

Case A.

- a single page outline of the major themes

Case B.

- 10 pages of undigested notes

(both made good starting points)

Project stages

- Exploration
 - Consider different project topics
 - Explore the literature, methods
- Execution
 - Focus on one topic
 - Generate the results
- Closure
 - Close off options
 - Complete

Creative and Evaluative

- Good science often proceeds by alternating stages of creative and evaluative work
- What do people who are good at brainstorming do?
 - Play with ideas (e.g., generate 6 titles)
 - Work out the consequence of different ideas
- What do people who are good at evaluation do?
 - Select the best idea and work that through
 - Follow logical chains

Break

Part B

- Deliverable #2. Annotated bibliography
- Deliverable #3. Project plan (swales 4b)
 - Describe the specific aims for your project and the methods to be used
 - The full Swales technique will be covered in next week's lecture

Writing to develop understanding

- Week 1: Getting started.
- Week 2: Find literature and methods
- Week 3: Understand the issues, build methods skills
- Weeks 4-5: Start writing, make progress
- Week 6: Draft report, refine your understanding
- Week 7. Full report, time Management
- Week 8. All systems go

Time management 101

- Effective use of time
 - E.g. sharpening pencils
- Case study
 - Study of workers (5, 10, 30 mins planning)

What is time management?

Finish the sentence:

The aim of time management is ...

Time management

*The aim of time management is
to do **less***

more efficiently and at a higher quality

- A. Time management
- B. Space management
- C. Information management
- D. Self management

Time management

- The art of choosing what to do at each moment
- 4 Quadrants
- Energy peak efficiency – not too low not too high
- Work before play? or Play before work?
- Focus and execution

4 Quadrants

	Urgent	Not Urgent
Important	1	2
Not Important	3	4

“To do lists” & “Don’t do lists”

- In deciding what to do at any moment, it is equally important to decide things not to do.

Managing the lists

- How often should you plan your time?
 - yearly, monthly, weekly, daily, hourly
- Make the planning effective
 - Using a diary: paper or electronic?
 - Setting reminders
 - Make the highest priority most visible
- Have one current list
 - Throw all other lists out

Classic

Task management advice

- Create a list of the tasks you need to do today
- Against each one, mark them A, B, or C priority
 - A. Must be done
 - B. Good to get done but not essential today
 - C. Not essential
- Under the A list, prioritize A1, A2, A3, etc
 - Only one item can be A1
- Start at A1.

Procrastinators' tips

- Start with the hardest thing on the list
 - Start with the easiest thing on the list
 - Work for 5 minutes
-
- References: 101 tips for procrastinators (check any library catalog)

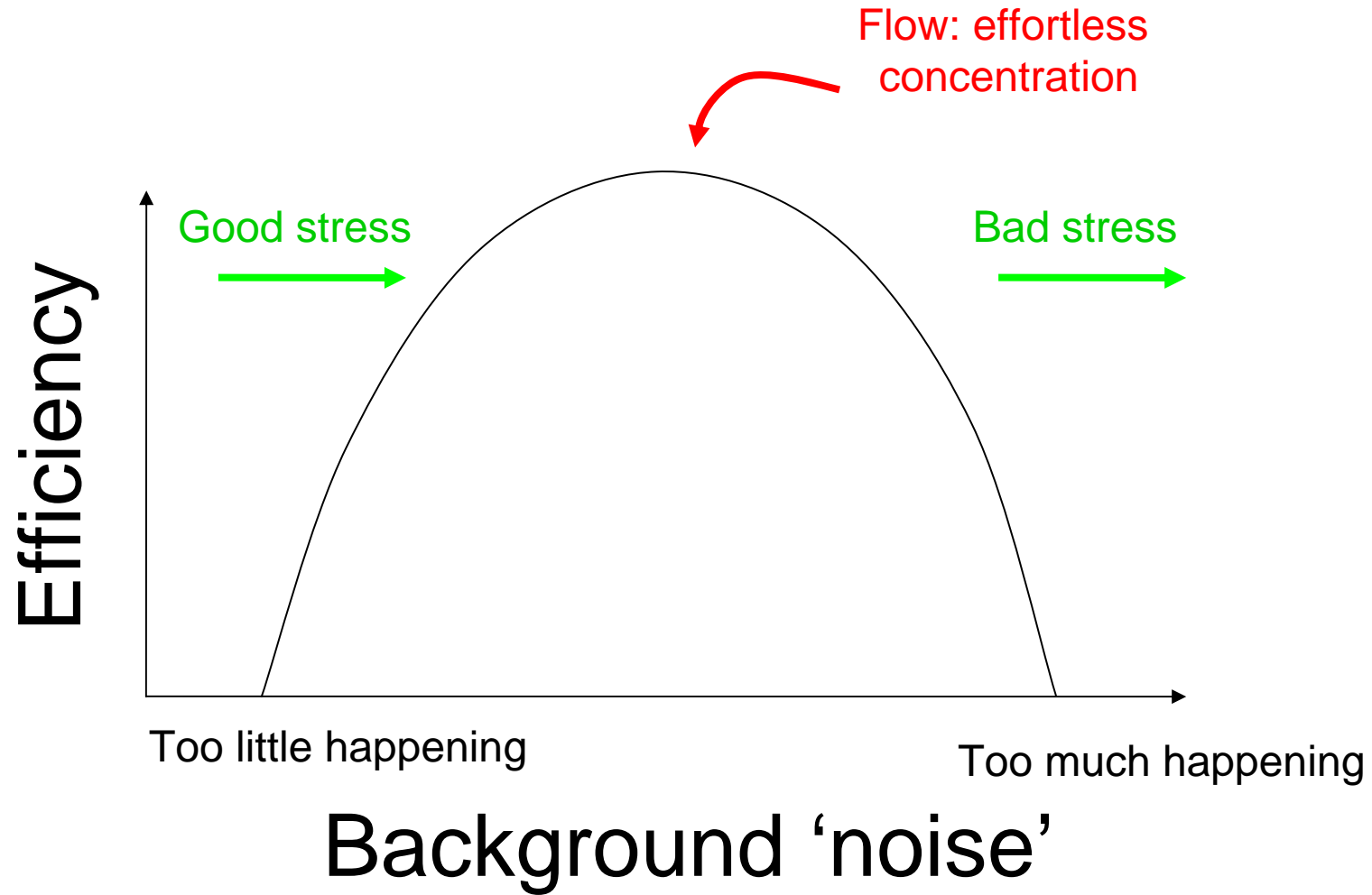
People differ

- Time management advice that works for one person may be completely wrong for another.
- Consider swapping glasses with the person next to you...

Know yourself

- Get to know your style and understand what things you find easier or harder:
 - Energy: internal or from others?
 - Be effective at concentrating
 - Thinking: concrete or abstract?
 - Writing drafts with details first or structure first?
 - Reasoning: logic or feelings?
 - Planning: make and keep plans vs. make plans but change them easily
- Myers Briggs Type Indicator (MBTI)
 - Reference: “Gifts Differing”

Peak efficiency



Differences in personality styles for studying

1. Structure (SJ): Likes to be organized: likes examples to follow, wants to know that a task is achievable, makes and follows plans
2. Rationalist (NT): Likes challenges: logical, clear thinker, likes to work on tasks that someone claims are impossible
3. Action (SP): Likes excitement: colour, movement, action, learns through doing
4. Idealist (NF): Likes to understand the meaning of what they do

Work before play
or play before work?

Work before play or play before work?

- This is not a morality question!
- It is a classic division of the population into people who
 - Find it hard to relax before they complete their tasks
 - Others who find it much more productive if they can get into a flow state to work, and find that state easier to reach after relaxation
- The first is the way we are taught is “right”, and the second group are often made to feel guilty for using their natural talents in the most effective way possible.
- Managing the quality of work produced is different for the two groups.

Thinking like someone who gets things done

“I don’t want to deal with it later,
so I deal with it immediately”

Execution:

The discipline of getting things done

“Focus deals with what matters most, and execution deals with making it happen.” ¹

- Focus is modeling and pathfinding.
 - “Pathfinding is essentially strategic work; it’s deciding what the higher-priority goals are – what values are to serve as guidelines in accomplishing and sustaining those goals.”
 - Focus is putting first things first.
- Execution is aligning and empowering.
 - “[Execution] means creating structures, systems and processes (aligning) that intentionally enable individuals and teams to translate the organization’s larger “line-of-sight” strategic goals or critical priorities (pathfinding) into their actual day-to-day work and team goals. In short, people are empowered to get the job done.”

¹ p. 272 Covey The 8th Habit

Ref: Ram Charan and Larry Bossidy, *Execution: The discipline of getting things done*.

Covey's six core drivers to execution¹

1. **Clarity:** what are the goals of the project? If the project is part of a larger study, what are the priorities?
2. **Commitment:** What are your own personal goals for the year? How do they align with the project goals?
3. **Translation:** What do you individually have to do to achieve the project goals?
4. **Enabling:** What are the structures, materials and technology (hardware and software) that you need to do your tasks well?
5. **Synergy:** Work with a support team – supervisor, fellow students, resource people. Who is your extended network?
6. **Accountability:** Keep yourself accountable. How will you measure performance towards your goals? Make and keep deadlines.

¹ Adapted for research projects from Covey, the 8th Habit, p. 275

Questions on time management?

B. Space management

1. **Easy to file and easy to find**

Putting things away should be quick and easy, and the most frequently used items should be the easiest to file and to find again.

2. **Finger tip management:**

When sitting at your desk, all major items should be within easy reach

From Good organisation

C. Information management

- File systems
- Backup strategy

D. Self management

5 Key lifestyle factors affect your productivity

1. how well you sleep
2. how well you eat
3. how active you are
4. how you think
5. how you manage stress

- Understanding how lifestyle affects your brain chemistry is one way to improve your productivity.
- The body and brain have hundreds of chemicals that contribute to our physical and mental behaviour. Many are affected by our lifestyles.

The notes on this page are mainly summarized from Church, M. (2003). *Adrenaline junkies: a guide to life in the fast lane*. ABC; and Pinel, P.J.P. (1997). *Biopsychology*. 3rd edition, Allyn and Bacon, Boston. Many readable accounts of body and brain chemistry have been published (and also some rather fanciful ones).

http://www.itee.uq.edu.au/~comp4809/wiki/index.php/Check_your_lifestyle

Know yourself

- Get to know your style and understand what things you find easier or harder:
 - Energy: internal or from others
 - Be effective at concentrating
 - Thinking: concrete or abstract
 - Writing drafts with details first or structure first?
 - Reasoning: logic or feelings
 - Planning: make and keep plans vs. make plans but change them easily
- Myers Briggs Type Indicator (MBTI)
 - Reference: “Gifts Differing”

Brain chemicals

1. **Adrenalin** is a fast acting chemical which produces a quick high and heightened alertness. The adrenaline high can be addictive and the adrenaline junkie is full on or asleep, and when nothing is happening, they feel vaguely depressed.
2. **Serotonin** is slower acting and gives you a feeling of calm, happiness and enduring motivation. The calm readiness of being in "flow" (the highest state of productivity) needs a balance of adrenaline and serotonin.
3. **Cortisol** works collaboratively with adrenaline to manage stressful events. Good stress (called *eustress*) helps us stretch and expand our comfort zone. Too much or chronic stress is bad stress or distress). Events affect different people in different ways, depending on how they think about them, their fitness levels, among other things. Too much cortisol gives a feeling of irritation and high anxiety and can lead to burnout and exhaustion.
4. **Melatonin** works with serotonin to create the sleep-wake cycle. Children produce high levels of melatonin during sleep and as we grow older the nightly peak is much lower. It surprises many people who don't have deep refreshing sleep to find out that good sleep is a learned behaviour.
5. **Insulin** regulates levels of blood glucose. Swinging insulin levels cause daily ups and downs. What we eat and exercise are two keys to managing fluctuating insulin levels.

Week 2 Summary

- Plagiarism: what it is and how not to do it
- References: know how to read them; reference them in your text; and in the reference list; keep good notes
- Time management: doing less, more efficiently and at a higher quality