ATHK1001 Analytical Thinking

Unit of Study Code: ATHK1001

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Format of Unit: 3 x 1 hour lectures/week x 13 weeks
Tuesday 9am, Thursday 12pm in Eastern Avenue Auditorium
Wednesday 9am in Wallace Theatre
1 x 1 hour tutorial for 13 weeks

Credit Point Value: 6 Credit Points

Prerequisites: None

Assessment:
- Assignment 1 (15% of the total mark) 750 word assignment
  Due Date: Week 6, Friday 11th April 4pm (online submission)

- Assignment 2 (20% of the total mark), 1000 word assignment
  Due Date: Week 10, Friday 16th May 4pm (online submission)

- Mastery quizzes (10% of the total mark): Every two weeks an on-line mastery quiz will be made available. Each quiz is worth 2% and can be done as often as you like. Your final score for the quiz is your best score. Only your five best quizzes count towards the 10% total. The primary goal of these quizzes is to encourage you to engage continuously with the lecture and tutorial material.

- Tutorial participation (5% of the total mark)
  You must attend 80% or more of your tutorial classes to obtain any part of this 5%, else you will receive 0 for this part of the assessment. NB: IT IS YOUR RESPONSIBILITY TO ATTEND THE TUTORIAL YOU ARE ENROLLED IN TO BE MARKED AS PRESENT.

Final Examination (50% of the total mark):
- Multiple choice questions for Data Concepts and Analysis (40%), multiple choice questions for Thinking Tools (30%), and short-answer questions for Logic and Critical Reasoning (30%)

Out of class prescribed student workload: Extra practice exercises associated with lectures and tutorials as will be assigned and working towards assessment tasks

Penalties for late submission of Assignment 1 or 2: Late submission of these assignments will be penalized at the rate of 10% of the available marks for each part of a week the assignment is late. You cannot receive any marks for an assignment submitted after it has been returned to other students. NOTE: BOTH ASSIGNMENTS MUST BE HANDED IN ORDER TO BE ELIGIBLE TO PASS THE COURSE, EVEN IF YOU CANNOT RECEIVE MARKS FOR THEM.

NB ATHK1001 is administered by the School of Psychology in the Faculty of Science, so it is governed by their policies. You should read the general administrative guidelines for submission of written work, assessment criteria, procedures for applying for extensions and special consideration in the “Information for Undergraduate Students” document on the School of Psychology web page (www.psych.usyd.edu.au).
Unit of study general description:
Analytical Thinking is a course covering aspects of reasoning, logic, data handling, research design, interpretation of data analysis, and understanding of relationships between variables. It is comprised of three sections: Data Concepts and Analysis, Logic and Critical Reasoning, and Thinking Tools. The section on data concepts and analysis covers aspects of research design, data collection, literature review and basic forms of hypothesis testing are statistical tests are introduced. The logic and critical reasoning section covers material ranging from valid and invalid forms of argument and errors in reasoning to critiques of arguments presented in case studies. The thinking tools section looks at the errors people make in reasoning, decision making and problem solving and how to avoid these errors. Together, the three course components teach foundational skills necessary for carrying out meaningful academic discussions, arguments, and research studies, which may be applied to any content area of enquiry.

Graduate Attributes and Student Learning Outcomes for Analytic Thinking
Graduate attributes are generic skills that encompass not only technical knowledge but additional qualities that will equip students to be strong contributing members of professional and social communities in their future careers. The overarching graduate attributes identified by the University relate to a graduate’s attitude or stance towards knowledge, towards the world, and towards themselves. These are understood as a combination of five overlapping skills or abilities, the foundations of which are developed as part of specific disciplinary study.

1: Research and Inquiry
Graduates of the University will be able to identify and analyse problems, and be both creative and principled thinkers within their discipline.

Student learning outcomes for Analytical Thinking:
(i) Demonstrate the ability to critique the arguments of others.
(ii) Exercise logic and reasoning in the formation of arguments.
(iii) Understand and evaluate the quality of data based on its sources and the manner in which it was obtained.
(iv) Identify the best way of approaching the exploration of a research question.
(v) Identify errors in thinking and how to avoid them.

2: Information Literacy
Graduates of the University will be able to use information effectively in a range of contexts.

Student learning outcomes for Analytical Thinking:
(i) Demonstrate an understanding of different types of variables and the ways in which they can be used.
(ii) Demonstrate the ability to identify premises of arguments and evaluate these.
(iii) Understand potential sources of bias in information.
(iv) Understand the limitations of a source of information and incorporate this into the way in which that information is used.

3: Personal and Intellectual Autonomy
Graduates of the University will be able to work independently and sustain an attitude of openness and capacity to meet new challenges.

Student learning outcomes for Analytical Thinking:
(i) Demonstrate an active participation in debate and discussion.
(ii) Demonstrate the ability to work independently and as a member of a group of students.
(iii) Show a willingness to engage with and respond to unfamiliar problems.
(iv) Demonstrate the ability to regulate learning independently by using course resources appropriately.
(v) Demonstrate the ability to autonomously direct inquiry for the purpose of answering an empirical question
4: Ethical, Social and Professional Understanding
Graduates of the University will hold personal values and beliefs consistent with their role as responsible members of local, national, international and professional communities.

*Student learning outcomes for Analytical Thinking:*
(i) Recognise the ethical requirements of academic research and discourse.
(ii) Respect and support the practice of sound data collection and analysis.
(iii) Respect and uphold the value of diversity in opinions and beliefs.
(iv) Uphold the value of honesty, transparency, and rigour in all academic pursuits.

5: Communication Skills
Graduates of the University will use and value communication for negotiating, creating new understanding, interacting with others, and furthering their own learning.

*Student learning outcomes for Analytical Thinking:*
(i) Active participation in tutorials

Evidence of learning

*Data Concepts and Analysis*
Assessment will take the form of a 750 word assignment, which will focus on research skills. It will be based on skills taught in lectures and tutorials in the first third of the course. 40% of the final examination will further assess knowledge of lecture and tutorial material.

*Logic and Critical Reasoning*
This section will be assessed via a 1000 word assignment requiring students to apply critical reasoning skills and demonstrate mastery of these. 30% of the final examination will further assess knowledge of lecture and tutorial material.

*Thinking skills*
30% of the final examination will assess knowledge of lecture and tutorial material from this section.
**SYLLABUS**

*Data Concepts and Analysis*

**Structure of academic inquiry**
Introduction to the general process of investigation, be it theoretical or empirical. Understanding research questions and the types of empirical studies to which these may lead. Learning to pose good research questions and to design studies addressing them. Introduction to research ethics.

**Sources of data**
Understanding of the ways in which bias may be introduced into data. Introduction to the concepts of validity of interpretations and conclusions. Introduction to types of error and best practice for managing these.

**Numerical and graphical summaries**
Introduction to basic types of variables and basic numerical summaries of central tendency and variability.

**Hypotheses and Statistical testing**
Introduction to null and alternative hypotheses for research. Introduction to the overarching process of hypothesis testing. Brief coverage of research design and how this draws together aspects of research questions, hypotheses, testing, and analysis procedures. Introduction to the general form of a statistical test.

*Logic and Critical Reasoning*

**Elements of argument**
Introduction to the structure of arguments and explanations. Identifying deductive validity and soundness. The role of meaning and definition in argument.

**Non-Deductive Argument**
Induction and inductive scepticism. Distinguishing causation from correlation. Reasoning with conditional probabilities.

**Case Studies**

*Thinking Tools*

**Reasoning, decision making and problem solving**
Introduction to what research into thinking tells us about the errors in reasoning, how to be better decision makers and how to approach new problems.

**Effective learning**
Applying what we know about memory and skill acquisition to formulate principles for how people learn most effectively.
### TIMETABLE

<table>
<thead>
<tr>
<th>WEEK (begin)</th>
<th>LECTURES</th>
<th>TUTORIALS</th>
<th>Due dates</th>
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| 1 (3/3)      | 1. Why study analytic thinking?  
               2. Scientific method  
               3. Finding what is known | Tutorial 1: Orientation | Quiz 1 due by 4pm 7/3 |
| 2 (10/3)     | 4. Trustworthy data  
               5. Bias & error  
               6. Sampling | Tutorial 2: Formulating research questions | |
| 3 (17/3)     | 7. Quantitative data  
               8. Qualitative data  
               9. Study types | Tutorial 3: Instructions for Assignment 1 | Quiz 2 due by 4pm 21/3 |
| 4 (24/3)     | 10. Drawing conclusions  
               11. The hypothesis  
               12. Significant differences | Tutorial 4: Ethics in research | |
| 5 (31/3)     | 13. Analysing means  
               14. Analysing categorical data  
               15. Correlational data | Tutorial 5: Testing hypotheses | Quiz 3 due by 4pm 4/4 |
| 6 (7/4)      | 16. Arguments and Explanations  
               17. Conditionals and Counterexamples  
               18. Deduction, Validity and Soundness | Tutorial 6: Statistical tests | Assignment 1 due 4pm 11/4 |
| 7 (13/4)     | 19. Bi-conditional & Definition  
               20. Induction & Inductive Scepticism  
               21. Abductive Arguments | Tutorial 7: Arguments, Conditionals, Deduction | Quiz 4 due by 4pm 17/4 |
| (20/4)       | NON-TEACHING WEEK | | |
| 8 (28/4)     | 21. Arguments by Analogy  
               22. Fallacies  
               23. More Fallacies | Tutorial 8: Definitions, Induction | |
| 9 (5/5)      | 24. Causal Explanations  
               26. Probabilistic Reasoning | Tutorial 9: Fallacies | Quiz 5 due by 4pm 9/5 |
| 10 (12/5)    | 28. Introduction to Thinking Skills  
               29. Reasoning errors  
| 11 (19/5)    | 31. Heuristics and biases  
               32. Decision making 1  
               33. Decision making 2 | Tutorial 11: Reasoning | Quiz 6 due by 4pm 23/5 |
| 12 (26/5)    | 34. Problem solving 1  
               35. Problem solving 2  
               36. Creativity | Tutorial 12: Decision making | |
| 13 (2/6)     | 37. Improving thinking and learning 1  
               38. Improving thinking and learning 2  
               39. Big data | Tutorial 13: Data and reasoning | Quiz 7 due by 4pm 6/6 |

Note that lecture titles may be subject to change. In the unlikely event that due dates for any assessment change you will be informed in good time by e-mail, postings on the courses e-learning site, and in lecture.
Academic Dishonesty and Plagiarism

1. It is your responsibility to know what academic dishonesty and plagiarism are. Here is the link to the University's policy:


   Make sure that you understand what counts as academic dishonesty and the various types of plagiarism. The Library’s ‘Plagiarism and Academic Honesty’ program will help:

2. Note that:

   i) the School of Psychology will penalise all submitted work that is plagiarised.

   ii) Students should note that all assignments (including group projects) will be run through similarity detecting software. This software detects similarities between (a) your assignment and both print and online sources, and (b) assignments submitted by other students, from both current and previous years. If similarities are found, they will be investigated so as to determine the nature of the plagiarism. See Part 5 of the University's policy.

   For guidance plagiarism and how to avoid it you should consult the document "Information for Undergraduate Students" document on the School of Psychology web page (www.psych.usyd.edu.au).

Special consideration (e.g., for health issues)

If your study is affected by factors such as health you may request special consideration. All requests from ATHK1001 students should be submitted to the Faculty of Science. Information and procedures can be found on the Faculty of Science Webpages, in particular: