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, Friday 12pm  
• Eastern Avenue Auditorium  
1 x 1 hour tutorial/week x 12 weeks

Credit Point Value: 6 Credit Points

Prerequisite: None
Assessment:

Classwork (50%):

Data Concepts and Management

1000 word assignment (15% of the total mark),
Due Date: Week 5, Thursday 5th April

Logic and Critical Reasoning

1000 word assignment (15% of the total mark),
Due Date: Week 9, Friday 11th May

Analysis and Interpretation

Tutorial-based assessment (15% of the total mark),
Date: Held in your tutorial in Week 13

Tutorial participation (5% of the total mark)
You must attend 90% or more of your tutorial classes to obtain this 5%, else you will receive 0 for this part of the assessment

Examination (50%):

Multiple choice questions for Data Concepts and Management (33.3%), multiple choice questions for Analysis and Interpretation (33.3%), and short-answer questions for Logic and Critical Reasoning (33.3%)

Out of class prescribed student workload:

Extra practice exercises associated with lectures and tutorials; conducting independent literature reviewing; conducting independent data analysis; completing tutorial and lecture preparation/readings; working towards assessment tasks

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 equally weighted sections: Data Concepts and Management, Logic and Critical Reasoning, and Analysis and Interpretation. The section on data concepts and management covers aspects of surveying, summarising information, data handling, research design, literature review and critiquing the validity of different types of data collection and summary. 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. In analysis and interpretation, basic forms of hypothesis testing with statistical tests are introduced and skills relating to carrying out and presenting an analysis of data are taught. 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 scientific enquiry.

EVIDENCE OF LEARNING

Data Concepts and Management
Assessment will take the form of a 1000 word assignment, which will focus on literature search and synthesis skills, together with basic principles for designing a sound research project. It will be based on skills taught in lectures and tutorials in the first third of the course. One third 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. One third of the final examination will further assess knowledge of lecture and tutorial material.

**Analysis and Interpretation**
A tutorial based task will assess the skills that are the focus of this section of the course. Students will be required to carry out some basic data analysis, present this meaningfully, and defend the conclusion of their analysis. One third of the final examination will further assess knowledge of lecture and tutorial material.

**Graduate Attributes and Student Learning Outcomes for Analytical 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) Demonstrate the ability to design an empirical investigation, taking account of the research question, feasibility issues in data collection, and issues of validity in data collection and analysis.
(vi) Carry out a basic analysis of data in response to a given question.

**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) Demonstrate the ability to use basic spreadsheet software to create effective and accurate summaries of information.
(iv) Understand potential sources of bias in information.
(v) 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
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) Participate in verbal discussion and debate in tutorials.
(ii) Submit at least two pieces of formal writing during the course in the form of assignments.

SYLLABUS

Data Concepts and Management

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. Learning how to find and assess sound sources of information.

Numerical and graphical summaries
Introduction to basic types of variables and to the concept of appropriate and inappropriate summaries. Introduction to basic numerical summaries of central tendency and variability. Introduction to standard graphical summaries for individual variables and combinations of
variables.

**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**

**Analysis and Interpretation**

**Hypotheses**
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.

**Statistical testing**
Introduction to the general form of a statistical test. Carrying out a z-test for a single mean, t-test for a single mean, related-samples t-test, independent samples t-test, Chi-square goodness of fit test and Chi-square test of independence. Introduction to One-way ANOVA and correlation (no calculations required for these two tests).

**Analysis skills**
Skills for correctly choosing and utilizing statistical tests for particular contexts. Interpretation and critique of analysis performed by others.

**RECOMMENDED TEXTS**
Note that none of these are required (ie examinable) reading, but all are considered useful supplements to course material. They are recommended to students who would like to further their understanding using support materials; the particularly relevant sections are listed in the course program, below. YOU ARE NOT REQUIRED TO BUY THESE BOOKS.

- This text has particularly good detail on statistical procedures for those who want to go beyond basic principles covered in lectures

- This text is extremely useable. It covers all procedures except z-tests and correlation, links tests to relevant examples, and demonstrates how software like Excel can be used for testing

- This relates most to issues in designing and critiquing approaches to research design and methodology, though it also includes some information on statistical testing

Note that the publisher has made online resources related to these three books available to students in ATHK1001 regardless of whether they have purchased the books. The course website will have details directing you to these resources.
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* Note that attendance and participation in tutorials is compulsory and is worth 5% of the final mark (must attend at least 90% of tutorial classes to obtain this mark. Make sure your tutor marks you present when you attend class).
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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 http://www.library.usyd.edu.au/skills/ ‘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.

Avoiding plagiarism – key points

• Plagiarism is a serious offence and may result in failure in the course. Even where students are completing an exercise together, each student must submit separate written work. Incorporation of any material from another student’s assignment is regarded as plagiarism.

• In writing essays or reports to meet coursework requirements, you should use your own words. In some contexts (e.g., theoretical research) it is appropriate to use an occasional quotation. This should be indicated in the conventional way by enclosing the passage within quotation marks and by providing a precise (page number) reference for the source of the quote. In many contexts, especially reports of empirical work, quotations are best avoided.

• “Using your own words” means that you should not borrow from the writing of others – whether from fellow students or published authors. For example, it is not acceptable to base an essay on text from various sources that you have then edited to some degree – even if you cite these sources. First of all, there is the ethical issue arising from the dishonesty of presenting as your own work something which is essentially the work of others. In addition, there are good educational reasons for avoiding this, even where you feel that someone else has expressed some idea far more clearly than you could. One reason is that you must learn to express yourself clearly in writing; like most other skills, this only comes with practice. Another, is the failure to understand information or ideas at all thoroughly if all you have done is reproduce (with some editing) what someone else has written about the topic.

• When you express in your own words what you have learned from various sources, you should cite each source. The standard convention for most written work in psychology is to list references at the end of your essay or report, rather than, for example, to use
footnotes. To express some idea without giving a citation implies that it is your own idea. Therefore, if it is in fact an idea obtained from someone else, this needs to be acknowledged. Listing a set of sources implies that you have read them all. Therefore, you should list as references only those you have actually read. If you are depending on a secondary source, then make this clear, e.g., ... salivary conditioning (Pavlov, 1927; cited in Mazur, 1998).

• The points made here also apply to non-textual material. For example, graphs or tables of data included in a report should be your own work and not copied from others. Very occasionally you may need to ‘quote’ a figure from some other source; if you do so, you should make its origin quite clear.

• In general, avoid letting other students use your work for any kind of assessment. On the rare occasion where this may be appropriate, make sure that the other student acknowledges your contribution as the original author.

• In some cultures, students show their respect for a teacher by copying what the teacher has said or written. In Australian University education, copying a teacher (even if paraphrasing) is plagiarism if the source is not cited.

For complete information on Special Consideration, see

FREQUENTLY ASKED QUESTIONS

Q: Will slides and audio recordings of lectures be available? When?
A: Yes, both will be available shortly after each lecture has been delivered. The powerpoint slides and/or notes for lectures can be downloaded from the eLearning page. There is a link on the eLearning page to Lectopia, where audio of lectures can be streamed or downloaded.

Q: Why aren’t lecture notes available before lectures?
A: There are two elements of lectures that are important to this issue. Firstly, we like to make lectures interactive wherever possible, so that people can raise questions, share ideas, and work collaboratively towards the solutions before these are revealed on the slides. Secondly, we like to have thorough lecture notes so that they make sense when you use them for studying later in semester. The most obvious way we can do both things for you is to give you the printed notes after lectures.

Q: How hard is the course material?
A: This will depend on how much exposure you have had to maths, stats, philosophy, and argument before, and how easily these skills come to you. In our experience, some students will find the material quite difficult whilst others will find it easy. Some students also find particular sections of the course easy and others difficult, depending on their own personal background. Our aim is that all students will have a strong grasp of the skills covered by the end of the course.

Q: What do I do if I’m finding the course material too hard?
A: Ask for help early. Your tutor is the best person to ask, or the lecturer responsible for that section of the course. You could use the recommended readings or online resources to help you gain a better understanding of the material. Make sure you keep going to tutorial classes and participating as best you can.

Q: What do I do if I’m finding the course material too easy?
A: You are in a good position if this is the case, as you are likely to be able to do very well. The main thing to remember is not to stop paying attention. Our assessment tasks require you to present work of an excellent standard to get a top mark, not just to find things easy or remember things well. Our advice is to use the additional resources to deepen the extent of your learning as desired, and to spend the time now integrating these skills into your main areas of study for your degree. ATHK1001 has been given to you in first year so that the skills we cover can be used throughout your University studies. By integrating those skills now, you will give yourself the best advantage for doing well in second and third year.
Q: What do I do if I require special assistance (eg, with visual, hearing or other aids; with use of academic English; with basic Mathematics; with overcoming difficulties cause by an illness or misadventure)?

A: The University has resources and procedures available for all of these situations. It is very important that you seek assistance as soon as possible for you particular need. If you have difficulty doing this, ask for help from a staff member connected with ATHK1001.

- If you have to miss an assessment task or due date, you need to lodge a Special Consideration request at the Faculty of Science office (see http://www.science.usyd.edu.au/cstudent/index.shtml). You will need to include documentation of your reason for missing the assessment or requesting an extension, and you will need to submit your request as soon as possible after finding out you will not be able to follow the set assessment procedure. The Faculty office decides the outcome of all Special Consideration requests, and informs course coordinators about the procedures that will be followed as a result.

- If you require special conditions or equipment in classes or in test situations, you need to contact Disability Services by visiting http://sydney.edu.au/stuserv/disability/index.shtml or contacting a Disability Services Officer disability.services@sydney.edu.au so they can put in place the assistance you require. Again, please do this as soon as you become aware that you will need extra services, so your equipment/conditions needs can be met throughout the whole semester.

- If you need help with an aspect of written or spoken English or with basic Mathematics, you should contact the Learning Centre and take part in a targeted program to build up these skills http://sydney.edu.au/stuserv/learning_centre/