



# STAT399

## Consulting in Statistical Sciences

S2 Day 2017

*Dept of Statistics*

### Contents

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<a href="#"><u>General Information</u></a>	2
<a href="#"><u>Learning Outcomes</u></a>	3
<a href="#"><u>General Assessment Information</u></a>	3
<a href="#"><u>Assessment Tasks</u></a>	3
<a href="#"><u>Delivery and Resources</u></a>	6
<a href="#"><u>Unit Schedule</u></a>	8
<a href="#"><u>Policies and Procedures</u></a>	9
<a href="#"><u>Graduate Capabilities</u></a>	10
<a href="#"><u>Changes from Previous Offering</u></a>	16

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#### **Disclaimer**

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## General Information

### Unit convenor and teaching staff

Lecturer

David Bulger

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TBA

Lecturer

Peter Petocz

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Credit points

3

Prerequisites

6cp STAT units at 300 level including STAT375 or STAT379

Corequisites

Co-badged status

Unit description

This unit integrates the core concepts of previous statistics units in the practical context of solving real research problems by the application of statistical ideas and methods. In particular, the unit aims to give students exposure to the statistical and non-statistical issues that arise in statistical problem solving, and to provide an experiential background in statistical consulting. Students develop the ability to appreciate the nature of statistical problems and discuss the statistical problem solving cycle; listen to a client's statement of a problem and ask appropriate questions for clarification; recognise appropriate statistical techniques for use in a variety of problems, and apply these techniques competently; recognise situations in which familiar techniques do not apply and search the literature for appropriate alternative techniques; write reports at an appropriate statistical level for a client or a colleague; give a verbal summary of a statistical investigation at a level appropriate for the audience; and discuss the ethical aspects and implications of professional statistical work.

## Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at <https://www.mq.edu.au/study/calendar-of-dates>

## Learning Outcomes

On successful completion of this unit, you will be able to:

- Identify and apply appropriate statistical techniques for authentic client projects
- Enhance critical thinking skills through self reflection and peer assessment
- Ask appropriate questions to identify a statistical problem
- Improve ability to work co-operatively as a team member
- Write reports at an appropriate statistical level for a client or a colleague
- Give a verbal summary of a statistical investigation at a level appropriate for the audience
- Discuss the ethical aspects and implications of professional statistical work
- Recognise situations in which familiar techniques do not apply and search the literature for appropriate alternative techniques

## General Assessment Information

**Assessment submissions** All assessments should be submitted electronically on iLearn, by the given due date and time.

**Extensions and penalties** No extensions will be granted, except for cases where a student has a **serious and unavoidable** disruption to studies. In this case, an application for disruption of studies is required from the student on the [ask.mq.edu.au](http://ask.mq.edu.au) system and needs to be approved by the Lecturer in charge.

**Group work:** STAT399 contains a group work project, divided over several assessments: AT5, AT2, AT6, AT7 and AT8. AT5 (30%) is assessed in common (each group member receives the same mark), whereas the others are individually assessed.

## Assessment Tasks

Name	Weighting	Hurdle	Due
<a href="#"><u>AT 1: Self Reflection</u></a>	5%	No	Week 2
<a href="#"><u>AT 2: Second Project Plan</u></a>	5%	No	Week 6
<a href="#"><u>AT 3: First Project Report</u></a>	25%	No	Week 7
<a href="#"><u>AT 4: Critical Evaluation</u></a>	10%	No	Week 9
<a href="#"><u>AT 5: Second Project Report</u></a>	30%	No	Week 11
<a href="#"><u>AT 6: Project Presentation</u></a>	10%	No	Week 13

Name	Weighting	Hurdle	Due
<a href="#">AT 7: Reflection</a>	5%	No	Week 13
<a href="#">AT 8: Participation</a>	10%	No	Weekly

## AT 1: Self Reflection

Due: **Week 2**

Weighting: **5%**

Self Reflection on Previous Learning

On successful completion you will be able to:

- Enhance critical thinking skills through self reflection and peer assessment

## AT 2: Second Project Plan

Due: **Week 6**

Weighting: **5%**

Project Plan

On successful completion you will be able to:

- Identify and apply appropriate statistical techniques for authentic client projects
- Ask appropriate questions to identify a statistical problem
- Improve ability to work co-operatively as a team member
- Write reports at an appropriate statistical level for a client or a colleague
- Discuss the ethical aspects and implications of professional statistical work
- Recognise situations in which familiar techniques do not apply and search the literature for appropriate alternative techniques

## AT 3: First Project Report

Due: **Week 7**

Weighting: **25%**

First Statistical Consulting Project

On successful completion you will be able to:

- Identify and apply appropriate statistical techniques for authentic client projects
- Ask appropriate questions to identify a statistical problem
- Write reports at an appropriate statistical level for a client or a colleague
- Discuss the ethical aspects and implications of professional statistical work

- Recognise situations in which familiar techniques do not apply and search the literature for appropriate alternative techniques

## AT 4:Critical Evaluation

Due: **Week 9**

Weighting: **10%**

Critical Evaluation of an Article

On successful completion you will be able to:

- Enhance critical thinking skills through self reflection and peer assessment
- Ask appropriate questions to identify a statistical problem
- Discuss the ethical aspects and implications of professional statistical work
- Recognise situations in which familiar techniques do not apply and search the literature for appropriate alternative techniques

## AT 5:Second Project Report

Due: **Week 11**

Weighting: **30%**

Project Report (written) including Memos/Minutes of Group Meetings (with or without client)

On successful completion you will be able to:

- Identify and apply appropriate statistical techniques for authentic client projects
- Ask appropriate questions to identify a statistical problem
- Improve ability to work co-operatively as a team member
- Write reports at an appropriate statistical level for a client or a colleague
- Discuss the ethical aspects and implications of professional statistical work
- Recognise situations in which familiar techniques do not apply and search the literature for appropriate alternative techniques

## AT 6: Project Presentation

Due: **Week 13**

Weighting: **10%**

One aspect of the second project will be presented by each group member (individually)

On successful completion you will be able to:

- Identify and apply appropriate statistical techniques for authentic client projects
- Ask appropriate questions to identify a statistical problem

- Improve ability to work co-operatively as a team member
- Write reports at an appropriate statistical level for a client or a colleague
- Give a verbal summary of a statistical investigation at a level appropriate for the audience

## AT 7: Reflection

Due: **Week 13**

Weighting: **5%**

Self Reflection on Group Process, technical aspects of the group project and statistical consulting experience

On successful completion you will be able to:

- Enhance critical thinking skills through self reflection and peer assessment
- Improve ability to work co-operatively as a team member
- Discuss the ethical aspects and implications of professional statistical work

## AT 8: Participation

Due: **Weekly**

Weighting: **10%**

Participation in Lectures and Tutorials: engaging in class discussions and exercises proactively

On successful completion you will be able to:

- Identify and apply appropriate statistical techniques for authentic client projects
- Enhance critical thinking skills through self reflection and peer assessment
- Ask appropriate questions to identify a statistical problem
- Improve ability to work co-operatively as a team member
- Write reports at an appropriate statistical level for a client or a colleague
- Give a verbal summary of a statistical investigation at a level appropriate for the audience
- Discuss the ethical aspects and implications of professional statistical work
- Recognise situations in which familiar techniques do not apply and search the literature for appropriate alternative techniques

## Delivery and Resources

### Classes

You should attend 2 hours of lectures and 2 hours of tutorials each week. They will start in Week 1.

## Required and Recommended Texts and/or Materials

Note that some of the following will be provided to students during semester.

Boen J & Zahn D, The Human Side of Statistical Consulting, Lifetime Learning Pubs, Belmont CA, 1982. (Not available in library)

Boomer K, Rogness N & Jersky B, Statistical consulting courses for undergraduates: fortune or folly, JSE, 15(3), 2007. (Electronic version QA276.18)

Chatfield C, Problem Solving: A Statistician's Guide, 2nd ed., Chapman and Hall, London, 1995. (QA276.12 .C457 1995)

Derr J, Statistical Consulting: A Guide to Effective Communication, Duxbury 2000. (HA29 .D386/2000)

Finch S & Gordon I, Lessons we have learned from post-graduate students, ICOTS8, 2010.

Hand DJ and Everitt BS (eds.), The Statistical Consultant in Action, Cambridge Uni Press, 1987. (Sections 1, 2 and 4 are available in Google.books)

Mackisack M & Petocz P, Projects for advanced undergraduates, ICOTS6, 2002.

McGinn M, Learning to use statistics in research: a case study of learning in a university-based statistical consulting centre, SERJ, 2010.

Peter Petocz, Anna Reid (2010) On Becoming a Statistician - A Qualitative View. International Statistical Review. 78(2): 271-286.

Rothman E, Teaching students and staff consultancy skills, ICOTS7, 2006.

Smith H & Walker J, Experiences with research teams comprised of graduate students, faculty researchers and a statistical consulting team, ICOTS8, 2010.

Wild C & Pfannkuch M, Statistical thinking in empirical enquiry, International Statistical Review, 67(3), 1-12.

ICOTS, SERJ and International Stat Review papers are available at <http://www.stat.auckland.ac.nz/~iase/publications.php>

International Statistical Institute <http://www.isi-web.org/>

The Statistical Society of Australia <http://www.statsoc.org.au/>

American Statistical Association <http://www.amstat.org/>

Statistical Society of Canada <http://www.ssc.ca/en/whats-new>

EURO (The Association of European Operational Research Societies) website: <https://www.euro-online.org/web/pages/1/home>

Australian Society for Operations Research <http://www.asor.org.au/>

INFORMS (The Institute for Operations Research and the Management Sciences) website: <http://www.informs.org/>

[s://www.informs.org/](https://www.informs.org/)

## Technologies used and required

We will use iLearn for distribution of course notes, readings, data sets, solutions, announcements and discussions. We would like you to use the 'Discussions' to communicate with other students and the lecturers to enable transparency between all the students and the lecturers. You can access the unit iLearn site from <http://ilearn.mq.edu.au> using your Student ID number and myMQ Portal password. If you have any problems go to the [http://www.mq.edu.au/ilearn/student\\_info/](http://www.mq.edu.au/ilearn/student_info/)

If you have a personal question, please send an e-mail to one of the lecturers through the iLearn e-mail facility (called dialogue) or alternatively a regular e-mail using your Macquarie University student e-mail account.

The lecturers will make announcements via iLearn. Accordingly, you should make sure you log in and read the posts at least twice a week. You might consider subscribing to iLearn posts this way you will not miss any posts.

## Teaching and Learning Strategy

- Students are expected to attend all the lectures and the tutorials.
- Readings will be provided through iLearn.
- Weekly tutorial exercises are set for individual development and considered formative assessment (no marks but suggestions for improvement will be given weekly to each student and as group feedback).
- Assessments are designed to enhance self reflection and peer assessment as well as providing individual learning if a real life problem requires an unknown statistical technique to be used for a proper solution to the problem at hand.

## Unit Schedule

WEEK	TOPIC	Staff
(1)	Introduction to consulting in statistical sciences Literature review	DB
(2)	Asking the right questions (oral communication skills)	DB
(3)	Human side of statistical consulting (Guest lecture) – Project work in tutorial	DB
(4)	Writing a statistical report (written communication skills)	DB



(5)	Working in a group (skills required for effective group work)	PP
(6)	Data preparation for analysis	PP
(7)	Statistical graphics	DB
	<b>Mid semester break</b> (two weeks)	
(8)	<b>NO LECTURE — PUBLIC HOLIDAY</b>	
(9)	Statistical thinking	PP
(10)	Ethics and statistics	PP
(11)	Project work – mini lectures	DB
(12)	Project work – mini lectures	PP
(13)	Presentations of final projects	DB & PP

*The order of the lectures might change, as some classes depend on the availability of clients and guest lecturers.*

DB = David Bulger

PP = Peter Petocz

## Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central](#). Students should be aware of the following policies in particular with regard to Learning and Teaching:

Academic Honesty Policy [http://mq.edu.au/policy/docs/academic\\_honesty/policy.html](http://mq.edu.au/policy/docs/academic_honesty/policy.html)

Assessment Policy [http://mq.edu.au/policy/docs/assessment/policy\\_2016.html](http://mq.edu.au/policy/docs/assessment/policy_2016.html)

Grade Appeal Policy <http://mq.edu.au/policy/docs/gradeappeal/policy.html>

Complaint Management Procedure for Students and Members of the Public [http://www.mq.edu.au/policy/docs/complaint\\_management/procedure.html](http://www.mq.edu.au/policy/docs/complaint_management/procedure.html)

Disruption to Studies Policy (in effect until Dec 4th, 2017): [http://www.mq.edu.au/policy/docs/disruption\\_studies/policy.html](http://www.mq.edu.au/policy/docs/disruption_studies/policy.html)

Special Consideration Policy (in effect from Dec 4th, 2017): <https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policies/special-consideration>

In addition, a number of other policies can be found in the [Learning and Teaching Category](#) of

Policy Central.

## Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: [https://students.mq.edu.au/support/student\\_conduct/](https://students.mq.edu.au/support/student_conduct/)

## Results

Results shown in *iLearn*, or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in [eStudent](#). For more information visit [ask.mq.edu.au](http://ask.mq.edu.au).

## Student Support

Macquarie University provides a range of support services for students. For details, visit <http://students.mq.edu.au/support/>

## Learning Skills

Learning Skills ([mq.edu.au/learningskills](http://mq.edu.au/learningskills)) provides academic writing resources and study strategies to improve your marks and take control of your study.

- [Workshops](#)
- [StudyWise](#)
- [Academic Integrity Module for Students](#)
- [Ask a Learning Adviser](#)

## Student Services and Support

Students with a disability are encouraged to contact the [Disability Service](#) who can provide appropriate help with any issues that arise during their studies.

## Student Enquiries

For all student enquiries, visit Student Connect at [ask.mq.edu.au](http://ask.mq.edu.au)

## IT Help

For help with University computer systems and technology, visit [http://www.mq.edu.au/about\\_us/offices\\_and\\_units/information\\_technology/help/](http://www.mq.edu.au/about_us/offices_and_units/information_technology/help/).

When using the University's IT, you must adhere to the [Acceptable Use of IT Resources Policy](#). The policy applies to all who connect to the MQ network including students.

## Graduate Capabilities

### Creative and Innovative

Our graduates will also be capable of creative thinking and of creating knowledge. They will be imaginative and open to experience and capable of innovation at work and in the community. We

want them to be engaged in applying their critical, creative thinking.

This graduate capability is supported by:

### **Learning outcomes**

- Enhance critical thinking skills through self reflection and peer assessment
- Ask appropriate questions to identify a statistical problem
- Write reports at an appropriate statistical level for a client or a colleague
- Give a verbal summary of a statistical investigation at a level appropriate for the audience
- Recognise situations in which familiar techniques do not apply and search the literature for appropriate alternative techniques

### **Assessment tasks**

- AT 2: Second Project Plan
- AT 3: First Project Report
- AT 4: Critical Evaluation
- AT 5: Second Project Report
- AT 6: Project Presentation
- AT 8: Participation

## **Capable of Professional and Personal Judgement and Initiative**

We want our graduates to have emotional intelligence and sound interpersonal skills and to demonstrate discernment and common sense in their professional and personal judgement. They will exercise initiative as needed. They will be capable of risk assessment, and be able to handle ambiguity and complexity, enabling them to be adaptable in diverse and changing environments.

This graduate capability is supported by:

### **Learning outcomes**

- Enhance critical thinking skills through self reflection and peer assessment
- Ask appropriate questions to identify a statistical problem
- Improve ability to work co-operatively as a team member
- Write reports at an appropriate statistical level for a client or a colleague
- Give a verbal summary of a statistical investigation at a level appropriate for the audience
- Discuss the ethical aspects and implications of professional statistical work
- Recognise situations in which familiar techniques do not apply and search the literature for appropriate alternative techniques

## Assessment tasks

- AT 2: Second Project Plan
- AT 3: First Project Report
- AT 4: Critical Evaluation
- AT 5: Second Project Report
- AT 6: Project Presentation
- AT 8: Participation

## Commitment to Continuous Learning

Our graduates will have enquiring minds and a literate curiosity which will lead them to pursue knowledge for its own sake. They will continue to pursue learning in their careers and as they participate in the world. They will be capable of reflecting on their experiences and relationships with others and the environment, learning from them, and growing - personally, professionally and socially.

This graduate capability is supported by:

## Learning outcomes

- Enhance critical thinking skills through self reflection and peer assessment
- Improve ability to work co-operatively as a team member
- Write reports at an appropriate statistical level for a client or a colleague
- Give a verbal summary of a statistical investigation at a level appropriate for the audience
- Recognise situations in which familiar techniques do not apply and search the literature for appropriate alternative techniques

## Assessment tasks

- AT 1: Self Reflection
- AT 4: Critical Evaluation
- AT 7: Reflection

## Discipline Specific Knowledge and Skills

Our graduates will take with them the intellectual development, depth and breadth of knowledge, scholarly understanding, and specific subject content in their chosen fields to make them competent and confident in their subject or profession. They will be able to demonstrate, where relevant, professional technical competence and meet professional standards. They will be able to articulate the structure of knowledge of their discipline, be able to adapt discipline-specific knowledge to novel situations, and be able to contribute from their discipline to inter-disciplinary solutions to problems.

This graduate capability is supported by:

## Learning outcomes

- Identify and apply appropriate statistical techniques for authentic client projects
- Enhance critical thinking skills through self reflection and peer assessment
- Write reports at an appropriate statistical level for a client or a colleague
- Give a verbal summary of a statistical investigation at a level appropriate for the audience
- Discuss the ethical aspects and implications of professional statistical work
- Recognise situations in which familiar techniques do not apply and search the literature for appropriate alternative techniques

## Assessment tasks

- AT 2: Second Project Plan
- AT 3: First Project Report
- AT 4: Critical Evaluation
- AT 5: Second Project Report
- AT 6: Project Presentation
- AT 8: Participation

## Critical, Analytical and Integrative Thinking

We want our graduates to be capable of reasoning, questioning and analysing, and to integrate and synthesise learning and knowledge from a range of sources and environments; to be able to critique constraints, assumptions and limitations; to be able to think independently and systemically in relation to scholarly activity, in the workplace, and in the world. We want them to have a level of scientific and information technology literacy.

This graduate capability is supported by:

## Learning outcomes

- Identify and apply appropriate statistical techniques for authentic client projects
- Enhance critical thinking skills through self reflection and peer assessment
- Ask appropriate questions to identify a statistical problem
- Write reports at an appropriate statistical level for a client or a colleague
- Give a verbal summary of a statistical investigation at a level appropriate for the audience
- Recognise situations in which familiar techniques do not apply and search the literature for appropriate alternative techniques

## Assessment tasks

- AT 1: Self Reflection

- AT 2: Second Project Plan
- AT 3: First Project Report
- AT 4: Critical Evaluation
- AT 5: Second Project Report
- AT 6: Project Presentation
- AT 7: Reflection
- AT 8: Participation

## Problem Solving and Research Capability

Our graduates should be capable of researching; of analysing, and interpreting and assessing data and information in various forms; of drawing connections across fields of knowledge; and they should be able to relate their knowledge to complex situations at work or in the world, in order to diagnose and solve problems. We want them to have the confidence to take the initiative in doing so, within an awareness of their own limitations.

This graduate capability is supported by:

### Learning outcomes

- Enhance critical thinking skills through self reflection and peer assessment
- Ask appropriate questions to identify a statistical problem
- Write reports at an appropriate statistical level for a client or a colleague
- Give a verbal summary of a statistical investigation at a level appropriate for the audience
- Recognise situations in which familiar techniques do not apply and search the literature for appropriate alternative techniques

### Assessment tasks

- AT 2: Second Project Plan
- AT 3: First Project Report
- AT 4: Critical Evaluation
- AT 5: Second Project Report
- AT 6: Project Presentation
- AT 8: Participation

## Effective Communication

We want to develop in our students the ability to communicate and convey their views in forms effective with different audiences. We want our graduates to take with them the capability to read, listen, question, gather and evaluate information resources in a variety of formats, assess, write clearly, speak effectively, and to use visual communication and communication technologies as appropriate.

This graduate capability is supported by:

## **Learning outcomes**

- Identify and apply appropriate statistical techniques for authentic client projects
- Enhance critical thinking skills through self reflection and peer assessment
- Ask appropriate questions to identify a statistical problem
- Improve ability to work co-operatively as a team member
- Write reports at an appropriate statistical level for a client or a colleague
- Give a verbal summary of a statistical investigation at a level appropriate for the audience
- Discuss the ethical aspects and implications of professional statistical work

## **Assessment tasks**

- AT 1: Self Reflection
- AT 2: Second Project Plan
- AT 3: First Project Report
- AT 4: Critical Evaluation
- AT 5: Second Project Report
- AT 6: Project Presentation
- AT 7: Reflection
- AT 8: Participation

## **Engaged and Ethical Local and Global citizens**

As local citizens our graduates will be aware of indigenous perspectives and of the nation's historical context. They will be engaged with the challenges of contemporary society and with knowledge and ideas. We want our graduates to have respect for diversity, to be open-minded, sensitive to others and inclusive, and to be open to other cultures and perspectives: they should have a level of cultural literacy. Our graduates should be aware of disadvantage and social justice, and be willing to participate to help create a wiser and better society.

This graduate capability is supported by:

## **Learning outcomes**

- Enhance critical thinking skills through self reflection and peer assessment
- Ask appropriate questions to identify a statistical problem
- Improve ability to work co-operatively as a team member
- Write reports at an appropriate statistical level for a client or a colleague
- Give a verbal summary of a statistical investigation at a level appropriate for the audience

- Discuss the ethical aspects and implications of professional statistical work
- Recognise situations in which familiar techniques do not apply and search the literature for appropriate alternative techniques

## **Assessment tasks**

- AT 2: Second Project Plan
- AT 3: First Project Report
- AT 5: Second Project Report
- AT 6: Project Presentation
- AT 8: Participation

## **Socially and Environmentally Active and Responsible**

We want our graduates to be aware of and have respect for self and others; to be able to work with others as a leader and a team player; to have a sense of connectedness with others and country; and to have a sense of mutual obligation. Our graduates should be informed and active participants in moving society towards sustainability.

This graduate capability is supported by:

## **Learning outcomes**

- Enhance critical thinking skills through self reflection and peer assessment
- Improve ability to work co-operatively as a team member
- Write reports at an appropriate statistical level for a client or a colleague
- Give a verbal summary of a statistical investigation at a level appropriate for the audience
- Discuss the ethical aspects and implications of professional statistical work
- Recognise situations in which familiar techniques do not apply and search the literature for appropriate alternative techniques

## **Assessment tasks**

- AT 3: First Project Report
- AT 5: Second Project Report
- AT 6: Project Presentation
- AT 8: Participation

## **Changes from Previous Offering**

The literature review component has been removed.