



**LA TROBE**  
UNIVERSITY

## Science TLOs for curriculum design

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La Trobe University

# Presentation...

The shape of curriculum reform

Curriculum renewal at La Trobe University: Design for Learning

Mapping and planning a new curriculum

Translating learning outcomes into assessment

# Curriculum reform: large-scale, iterative

**Curriculum mapping:** what **is** in the curriculum?

*Content (skills and knowledge), delivery and activities, assessment*



**Curriculum planning:** what **should** be in the curriculum?

*Plan using reference points...*

**Science TLOs** → Degree LO → Subject/topic/unit LO



**Implementation**

*Translate ILOs → teaching activities, assessment (alignment)*

*Assessment: evidence for student achievement*



**Evaluation**

*Outcomes: student perceptions, staff experience, sustainable?*

*Identify next target...*

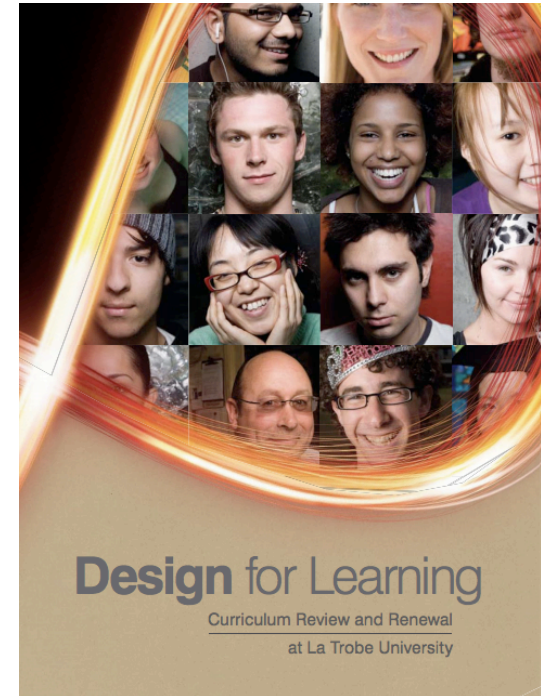


# Curriculum Renewal at La Trobe: Design for Learning 2010

Redesign all undergraduate courses to:

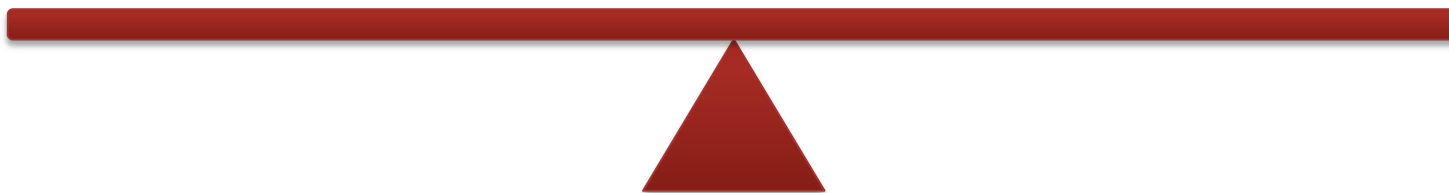
- Improve learning outcomes
- Improve the student experience
- Construct aligned courses of study
- Embed agreed University graduate capabilities
- Collect evidence of achievement of graduate learning outcomes

See <http://www.latrobe.edu.au/ctlc/dfl/>

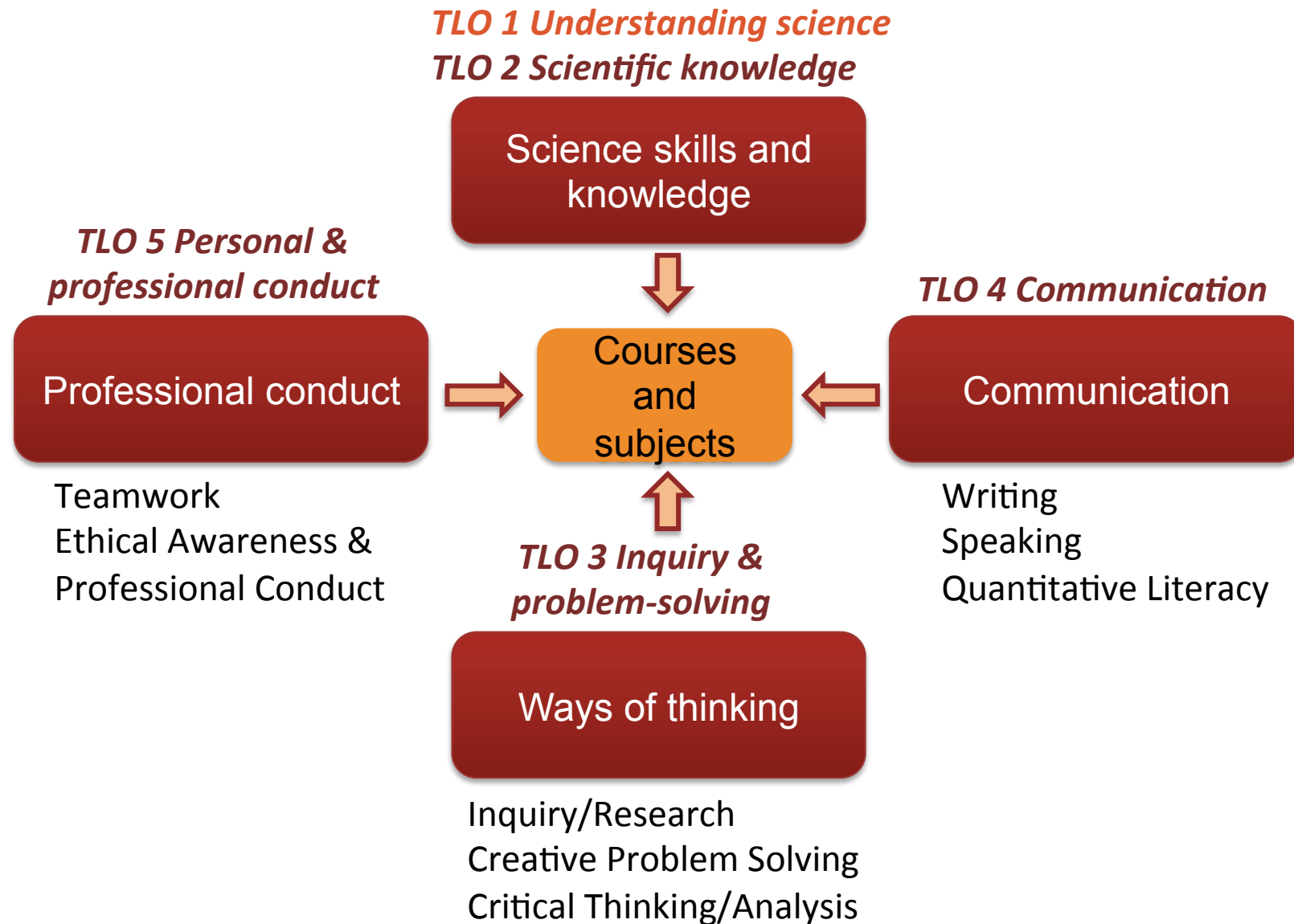


*Uni & Faculty*

*Discipline/Dept*



# Mapping TLOs to Uni graduate capabilities



# LTU interpretation of learning outcomes

## TLO 4: Communication

### 4. Be effective communicators of science by:

- 4.1 communicating scientific results, information, or arguments, to a range of audiences, for a range of purposes, and using a variety of modes.



### ***LTU Writing descriptor:***

Present coherent explanations, supported by evidence and correctly referenced



### ***Course intended learning outcome: B Computer Sci***

Create technical reports to communicate to peers, company stakeholders...consistent with professional standards

# Development through the curriculum

*Cornerstone* → *Midpoint* → *Capstone*

Bachelor of Science - Biotechnology Major  
Bendigo (SBSB) 2012



Faculty of Science, Technology and Engineering

Year One		Year Two		Year Three	
Semester 1	Semester 2	Semester 1	Semester 2	Semester 1	Semester 2
<b>BIO1CO</b> Biology of Cell and Organism WR SP QL TW DS CP CT IR EA	FACULTY ELECTIVE YEAR 1 LEVEL	<b>BIO2IMB</b> Introduction to Microbiology	<b>BIO2MES</b> Microbial Ecology & Systematics	<b>PHA4BT</b> Biotechnology	<b>BIO3ABT</b> Applications to Biotechnology
<b>CHE1C1A</b> Chemistry 1A WR SP QL TW DS CP CT IR EA	FACULTY ELECTIVE YEAR 1 LEVEL	FACULTY ELECTIVE YEAR 2 LEVEL	<b>BIO2MBC</b> Metabolic Biochemistry WR SP QL TW DS CP CT IR EA	CORE CHOICE YEAR 3 LEVEL	CORE CHOICE YEAR 3 LEVEL
FACULTY ELECTIVE YEAR 1 LEVEL	FACULTY ELECTIVE YEAR 1 LEVEL	FACULTY ELECTIVE YEAR 2 LEVEL	FACULTY ELECTIVE YEAR 2 LEVEL	ELECTIVE YEAR 3 LEVEL	ELECTIVE YEAR 3 LEVEL
ELECTIVE YEAR 1 LEVEL	ELECTIVE YEAR 1 LEVEL	ELECTIVE YEAR 2 LEVEL	ELECTIVE YEAR 2 LEVEL	ELECTIVE YEAR 3 LEVEL	ELECTIVE YEAR 3 LEVEL

All subjects are 15 Credit Points unless indicated otherwise

Last updated: 16 Dec 2011

WR Writing  
SP Speaking  
QL Quantitative Literacy

CP Creative Problem Solving  
CT Critical Thinking  
IR Inquiry Research

TW Teamwork  
EA Ethical Awareness and Professional Conduct  
DS Discipline Specific Graduate Capabilities

CORNERSTONE (YR 1)  
MIDPOINT (YR 2 or 3)  
CAPSTONE (YR 3 or 4)

This information is correct at the time of printing but subject to change.  
CRICOS Provider 00115M



# Discipline maps for planning

## TLOs/ Graduate capabilities

Subject/Yr level

Discipline Map for:	Version:	Discipline:	Date Completed:	PRE-ANALYSIS DISCIPLINE MAP	Key:	Depth 1	Depth 2	Depth 3										
	1	MATHEMATICS	12/Dec/2009 or 15/Feb/2010															
Writing	Speaking	Numeracy	Depth/Research	Critical thinking/analysis	Problem Solving/Synthesis	Teamwork	Info & Com literacy	Global Awareness	Discipline as									
fully argued answers required for full marks on almost all questions on assignments and on exam. Final solution only small section of marks. *Marks 2 out of 14 marks on every assignment explicitly identified for correct usage of mathematical grammar and connecting English words.		Most topics of the subject relate: assessed as central part of content. In particular "survival skills": tested online (10%) assignments (1%). *Checking of answers reinforced in checking of OE solutions, assessed in assignments and on exam (<5%)	Depth 1; in proof section. Implicitly assessed only.	*Geometric and pictorial visualisation taught and assessed. (1%) *A measured approach to proof is taught and assessed in one exam question. (<5%)	*Some undirected formal proof required on exam (1-2%). *Solving of integrals with unperfected method in exam and on assignment (10%).		Online mathematical testing requires use of WYISWYG mathematical package: 10% of final mark is based on mastery (at least 80%) in these tests.											
fully argued answers required for full marks on almost all questions on assignments and on exam. Final solution only small section of marks. *Marks 2 out of 14 marks on every assignment explicitly identified for correct usage of mathematical grammar and connecting English words.		*Each assignment has marks for reinforcement of basic skills from CNS. *Checking solutions reinforced through Des. *Topics associated with numerical approximation are assessed as part of subject content.	Some assignment and exam questions require students to judiciously apply only the correct one of several possible techniques for solving of DEs (depth 2)	*Linear algebra components strongly develops geometric visualisation in 3D. Assesses part of content. *Supporting diagrams required on assignments and exams (up to 5%). Classifying (mathematical) assessed on assignments (10%). Some analysis questions on final exam (1%).	*Word problems frequently modified though not assessed. *Solving of DEs without given method assessed on exam and assignments (5%). Bonus marks available for optional problem solving questions during semester.		*Independently sourcing information from notes; not assessed. *Online mathematical testing requires use of WYISWYG mathematical package: 10% of final mark is based on mark from these tests.											
fully argued answers required for full marks on almost all questions on assignments and on exam. Final solution only small section of marks. *Marks 2 out of 14 marks on every assignment explicitly identified for correct usage of mathematical grammar and connecting English words.		*Assessed as part of content: methods of counting (combinatorics) and theory of arithmetic operations. *Checking of recurrence relations is taught and assessed (around 5%). Theory of "big O" is assessed as major part of content (10%) and specifically concerns growth of functions.	*In exam, students must have mastered a wide variety of tools and algorithms and can apply them appropriately with minimal guidance.	*Graph theory and combinatorics are encountered, which are fundamental pictorial tools in visualising mathematical problems. Graphs assessed as major part of content (around 30%). *Some problems encountered (equations, etc.) and assessed on assignments (<1%). Automata theory and highly exploratory and assessed around 3% of final exam is of some problem solving form).	Genuine problem solving/synthesis topics in graph theory are assessed on final assignment and on exam (around 3%). Also automata theory questions (around 3%).	*Active listening in Lecture/Workshops not assessed.	*Some independent learning required from printed notes (sorting algorithms); assessed on assignments (1%). *Understanding of algorithm and of fundamental nature of computing devices, assessed as part of content.											
20% of assessment in this unit is in the writing of proofs. *15% / assignment marks are explicitly identified on solutions looking for mathematical grammar (around 3% of final mark).		*Mid-level concepts of formal number theory are a major topic (first quarter of subject), and assessed as part of content. *Methods of checking number theoretic solutions is taught and assessed.	*Open exploratory questions are worth up to 5 to 10% of final mark, but are optional. *Reading and interpretation of untaught proof is assessed on one assignment (1%). *Autonomous application of a variety of proof methods is expected, but not assessed, except in one assignment question.	*Logical arguments and formal skills are assumed from entry (where they are not) further reinforcement through building in lectures and guided problem tutorials. Around 20% of the marks associated with this.	*Some number-theoretic problems are expressed as word problems on assignments (1%). *One assignment question requires deeper thought to proof approach.		*Use of computers is suggested in optional exploratory project (worth up to around 5% of final mark if pursued).											
very major component of marks in both assignments and exam concern fully written proofs and arguments: coherent solutions (with explanation) are the main source of marks (up to 95% of marks). Correct referencing worth a small percentage.		*Basic numeracy mostly assumed; reinforced at higher level. *Growth of functions and limiting behaviour of functions and sequences is a central topic and assessed accordingly.	Expected to be able to apply various methods of finding limits and apply these; on assignments and exams, but students when need assistance. (5 to 10%.)	*Supporting diagrams and proofs are required and attract marks on both assignments and exam. *Proof is central to subject, and both exams and assignments contain questions requiring some competency in proof and logical reasoning. 5-10%	*Construction of proofs and solving of mathematical problems; required and assessed as part of content.													
Reinforced in assignment --		*Basic numeracy and graphical	Students expected to solve unfamiliar	Very high development of graphical	*Word problems and solving of real		Higher level use of graphics											

TLO 4  
Communication

TLO 3  
Inquiry & problem solving

TLO 5  
Personal & professional responsibility



## Constructive Alignment in subjects

Subject descriptions → peer review, refinement, approval

## FGCs /TLOs

## Course Learning Outcomes

## Subject Learning Outcomes ILOs

## Teaching and Learning Activities

## Assessment

Are Faculty Graduate Capabilities applicable to this subject? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No				
	Faculty Graduate Capability	Assessed in this subject?		Level of instruction <small>Please mark only ONE box if the FGC is assessed in this subject</small>
1	Writing	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Introduction <input checked="" type="checkbox"/> Reinforcement <input type="checkbox"/> Extension/Expansion
2	Speaking			
3	Inquiry/research			
4	Critical thinking			
5	Creative problem solving			
6	Team work			
7	Quantitative literacy			
8	Ethical/Awareness of conduct			

31. Intended Learning Outcomes and Teaching and Learning Activities for this Subject			
What learning outcomes would students expect from this subject? Please list and provide examples of Teaching and Learning activities that might develop and measure these outcomes. The learning outcomes must address any Graduate Capabilities identified above as being assessed in this subject.			
	Subject Intended Learning Outcomes (ILOs)	Example of Teaching and Learning Activities for this ILO	Aligned to which FGC(s)?
1	After successful completion of the subject, students will be able to:  demonstrate their knowledge and understanding of the structural functions of biological macromolecules by written descriptions and answer multiple choice questions.	Lectures and practical classes. In lectures students will be instructed in molecular interactions, information transfer and the synthesis and	1, 9
2	Explain how the metabolism are regulated to achieve homeostasis by written descriptions and answer multiple choice questions.		

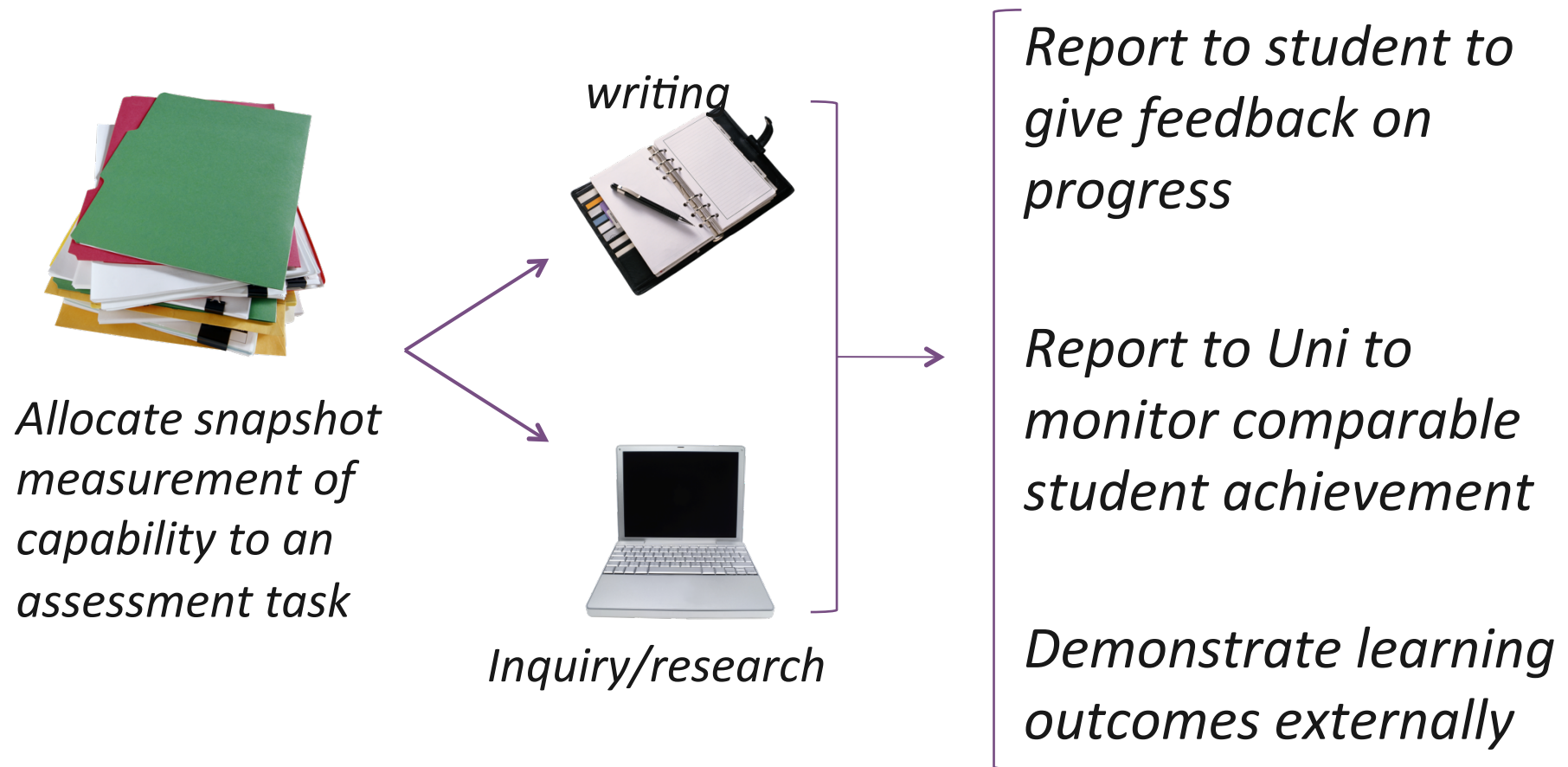
  

	Assessment element	Percentage	Included in these Instance(s) (enter #(s))	Central exam required?	Subject ILO(s) to be assessed in this element
1	Practical class assignments	5%	1	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	1, 2, 4, 6
2	Two practical reports equivalent to 1000-words each	25%	1	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	1, 2, 3, 4, 5, 6
3	Four 10-minute tests	15%	1	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	1, 2
4	One 3-hour end-of-semester examination	55%	1	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	1, 2, 3, 4, 6
5	Enter text	Enter %	Enter number	<input type="checkbox"/> Yes <input type="checkbox"/> No	Enter number
6	Enter text	Enter %	Enter number	<input type="checkbox"/> Yes <input type="checkbox"/> No	Enter number
7	Enter text	Enter %	Enter number	<input type="checkbox"/> Yes <input type="checkbox"/> No	Enter number
8	Enter text	Enter %	Enter number	<input type="checkbox"/> Yes <input type="checkbox"/> No	Enter number

Please use the section below if more explanation of assessment tasks is required

# Evidence for graduate outcomes

Progress towards graduate capabilities reported through subjects.



# Developing standards to assess outcomes

## Agreed Description

FSTE Graduate Capability		Faculty Graduate Capability Descriptors (agreed across disciplines)
Writing	WR	Present coherent explanations, supported by evidence and correctly referenced Create grammatically correct prose appropriate to the discipline
Speaking	SP	Present an oral explanation, supported by evidence, correctly referenced and appropriate to the audience Participate in discussions and demonstrate effective communication with professional colleagues
Quantitative Literacy (Numeracy)	QL	Use basic arithmetical calculations and graphical representations to manipulate and interpret data and/or information Measure and interpret the reliability of data

## Moderation with student work



**Faculty standards statement**

**Assessment rubrics**

## Identify elements

Writing	Year 1	Year 2	Year 3 +
Elements	Structure - format/presentation Logic & Organisation Grammar - spelling, punctuation Referencing - format/correctness Vocabulary & terminology Expression - clarity	Year 1 + ↑ task complexity/diversity	Year 2 + ↑ task complexity/diversity
Looks depend on: Complexity Depth Scaffolding	Describe Explain Use in context (scientific language) Parsimonious Acknowledge issues	Evaluate sources (quality of information) Present a logical argument (order, value) * For a disciplinary audience (professional/academic) AS WELL	Communicate a reasoned position (evidence, support an informed opinion) * For the discipline AS WELL
May/Kabyn = LAS → ALL	Using assessment tools Model referencing & format In-classroom guide Detailed assessment rubrics (providing feedback) Feedback - annotated comments - per item - relevant tasks	Detailed assessment rubrics Feedback - annotated comments - relevant tasks	Task-specific writing workshop Feedback through drafting & more individual responses

## Published rubrics

[www.aacu.org/value/rubrics/index\\_p.cfm?CFID=38559942&CFTOKEN=37073619](http://www.aacu.org/value/rubrics/index_p.cfm?CFID=38559942&CFTOKEN=37073619)

PROGRAMS MEETINGS PUBLICATIONS LEAP ★ PRESS ROOM

*Association of American Colleges and Universities*

PROGRAMS

**VALUE: Valid Assessment of Learning in Undergraduate Education**

# Faculty standard statement

Key  
assessment  
elements

FSTE Writing Standards			
Key assessment categories must apply to any task claiming to demonstrate achievement in the Graduate Capability. Individual statements regarding components within a key assessment category may not apply to all tasks.			
Definition of Writing: Present coherent explanations and grammatically correct prose, supported by evidence and correctly referenced.			
Key assessment elements	Listed below are key elements in assessing the 'Writing' component of an assessment piece. These elements either relate to Conventions, which include formatting and language criteria, or to Content communication, which focuses on how information and ideas are delivered.		
	Conventions and expression This includes:	<ul style="list-style-type: none"> <li>• Formatting/presentation of the writing. Does the student's writing follow designated conventions in terms of overall presentation and structure of the work? Are all the necessary components present (e.g. aim, abstract, tables)?</li> <li>• Purpose. Is the execution of the task in line with the intended purpose?</li> <li>• Referencing. When applicable to the assignment, have sources been referenced / cited?</li> <li>• English language skills. This refers to grammar, spelling, sentence construction, punctuation, use of linking words. Are sentences comprehensible or does the English language used impede the reader's understanding?</li> <li>• Appropriate language. When applicable, has discipline-specific terminology been used correctly? Is the language used appropriate for the intended audience (e.g. formal academic style for scientific reports)?</li> </ul>	
	Content communication This includes:	<ul style="list-style-type: none"> <li>• Structure, logic and clarity. Are information and ideas organised and are they presented in a logical way? Has a cohesive and coherent reasoning been developed? Is the writing concise, to-the-point, or is there unnecessary repetition of information? Is the information from subsequent paragraphs or sections linked? Is the writing fluent?</li> <li>• Is the text written in such a way that the content is clear? Have reasoning and opinions successfully been transferred into wording? Has sufficient relevant information and support been included to achieve this?</li> </ul>	
	Standard not met	Standard met	Standard exceeded
Year 1	<p>The following elements will result in the writing standard not being met. Writing tasks are usually accompanied with extensive and detailed learning activities, guidelines and/or feedback to assist students with preparation of assignments.</p> <p>The majority of elements have not been formatted correctly or major components are missing.</p> <ul style="list-style-type: none"> <li>• The work is not in line with the intended purpose of the task.</li> <li>• Sources have not been acknowledged or if so, very inconsistently or inaccurately.</li> <li>• There are noticeable English language problems, or the language used impedes the understanding of the sentences in many instances.</li> <li>• The writing shows very limited or incorrect use of discipline-specific terminology. The wording is mostly inappropriate for the intended audience.</li> </ul>	<p>The following criteria have to be demonstrated to meet the writing standard. The writing tasks are usually accompanied with extensive and detailed learning activities, guidelines and/or feedback to assist students with preparation of assignments.</p> <p>Overall, though, the work does not meet the standard, though some formatting errors or inconsistencies may be present. All, or nearly all, specified components are included.</p> <ul style="list-style-type: none"> <li>• The work is mainly in line with the intended purpose of the task.</li> <li>• Sources have been acknowledged, with only some errors in consistency and accuracy.</li> <li>• The English language skills used are acceptable and generally do not impede the understanding of the sentences.</li> <li>• Some discipline-specific terminology has been used to describe the content. The writing shows use of language appropriate for the intended audience, though this may be inconsistent.</li> </ul>	<p>The following criteria have been demonstrated to exceed the writing standard. The writing tasks are usually accompanied with extensive and detailed learning activities, guidelines and/or feedback to assist students with preparation of assignments.</p> <p>The work has been formatted correctly, with only minor errors. All specified components are present.</p> <ul style="list-style-type: none"> <li>• The work is in line with the intended purpose of the task.</li> <li>• Sources have been acknowledged consistently and accurately.</li> <li>• The English language skills used are good, with only a few errors. The language used does not hinder understanding.</li> <li>• Correct discipline-specific terminology has been used to present information, with only minor errors. The wording is most appropriate for the intended audience.</li> </ul>

Three levels of achievement:  
standard exceeded, standard  
met and standard not met.

# Ideas from others...good practice guides

- Key ideas
- Examples
- Resources



2012

**Good Practice Guide  
(Science)**

**THRESHOLD LEARNING  
OUTCOME 1  
Understanding Science**

## So... TLOs and curriculum reform?

### Map

track TLOs in  
current practice

### Design

reference point  
Science TLOS  
Discipline networks

### Evaluate

TLOs shared  
nationally

### Assessment

Rubrics  
Examples





# Who does all the work?



## Curriculum Fellows

Mel Murphy  
Pam Hurst  
Sylvia Grommen  
Robert Ross  
Martin Fussell  
Chris Kettle  
Sabine Wilkens

## School Directors Teaching and Learning

Art Stukas  
Fiona Bird  
Peter Cartwright  
Katherine Seaton  
Andrew Skabar

## FSTE teaching staff

Subject & Course co-ordinators  
Discipline leaders  
Cornerstone co-ordinators

## FSTE Teaching and Learning Team

Andy Frampton  
Kevin White  
Pauline Wardley  
Emma Yench  
Paul Goldacre  
Tania Blanksby  
Robyn Yucel  
Meg Rosse  
Reem Al-Mahmoud  
Judy Lyons  
Jeanette Fyffe







## Progress so far...

Embedding graduate capabilities (TLOs)	• Mapped across all undergraduate courses and majors	✓
	• Constructive alignment of all undergraduate subjects	✓
Assessment: shared standards	• Shared criteria for assessment	✓
	• Applying the standards/ • marking rubrics	Just started
A course-wide view	• Horizontal integration across Year 1	✓
	• Vertical integration within disciplines (Yr1 → Yr2 → Yr2)	Partly
	• Capstone design and trial	Just started

## Evidence beyond grades



Evidence for improvements in learning outcomes because:

- Success of reform
- QA for the future development
- Evidence for external regulators: TEQSA, professional accreditation

# Measuring learning outcomes in a standards world

**ACDS Teaching and Learning Centre**

# Shared understanding of learning outcomes

## Faculty → Discipline

Present coherent explanations, supported by evidence and correctly referenced

LA TROBE UNIVERSITY	
Faculty Graduate Capabilities	
Science, Technology and Engineering	
The Faculty of Science, Technology and Engineering has nine Faculty Graduate Capabilities. These are developed in each undergraduate course or major in the context of the discipline.	
FSTE Graduate Capability	Faculty Graduate Capability Descriptors (agreed across disciplines)
Writing	<p>Present coherent explanations, supported by evidence and correctly referenced</p> <p><b>Create professionally consistent reports appropriate to the discipline</b></p>
Speaking	<p>Present an oral explanation, supported by evidence, correctly referenced and appropriate to the audience</p> <p>Participate in discussions and demonstrate effective communication with professional colleagues</p>
Quantitative Literacy (Numeracy)	<p>Use basic arithmetical calculations and graphical representations to manipulate and interpret data and/or information</p> <p>Measure and interpret the reliability of data</p> <p>Apply relevant concepts from mathematics and statistics to the discipline</p> <p>Engage in independent and reflective learning</p>
Inquiry/Research	<p>Demonstrate skills to appropriately locate, evaluate and use relevant information</p> <p>Use computers to locate relevant information, analyse and store data, prepare reports</p> <p>Demonstrate intellectual and practical skills needed to use appropriate analytical tools</p>
Critical Thinking/Analysis	<p>Collect, collate and interpret experimental and published data</p> <p>Analyse, reason logically and conceptualise ideas</p>
Creative Problem Solving/Synthesis	<p>Solve constructed and real-world complex scientific/technical problems</p> <p>Identify and describe problems and use conceptual, analytical, problem solving strategies</p>
Teamwork	<p>Collaborate with colleagues using effective communication, interpersonal skills and team-building</p> <p>Listen actively and thoughtfully to develop and negotiate ideas</p> <p>Ability to manage time and resources effectively, prioritising competing demands</p>
Ethical Awareness and Professional Conduct	<p>Respect for the work of others: appropriate citation</p> <p>Use, and work empathetically within, professional standards and guidelines</p> <p>Ability to operate in a diverse and globally oriented society</p>
Discipline Specific Graduate Capabilities	<p>To be defined by the discipline area usually including the understanding and use of key vocabulary, concepts and skills</p>

Progress towards graduate capabilities is reported to the University through cornerstone, midpoint and capstone subjects.

Capabilities reported in a subject appear highlighted on course maps. All subjects contribute to the development of graduate capabilities.

BIG OUP  
Organisation and Function of Cells and Organisms



Create technical reports to communicate to peers, company stakeholders...consistent with professional standards

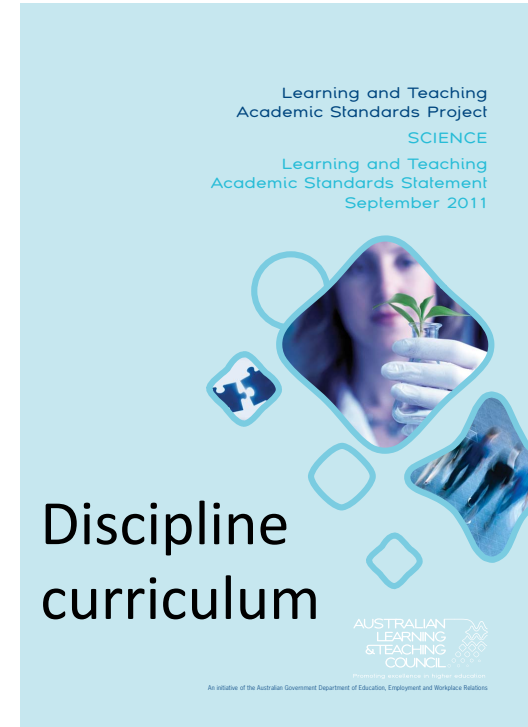
B Computer Science (M)(APPROVED) CILO.xlsx [Read-Only]	
Course title:	Bachelor of Computer Science
Campus: (Albury Wodonga)	Melbourne
Key contacts:	Fai Liu, Wenny Rahayu, Phoebe Chen and Robert Parr
Version:	E
Last Updated: (DD-MM-YY)	27-May-11
Faculty Graduate Capability	Course Intended Learning Outcome
Writing	Graduates in <b>Computer Science</b> are expected to have demonstrated, to faculty standards, they can:
Speaking	Conduct clearly spoken and engaging explanations and presentations that communicate at an appropriate professional and technical level to a variety of audiences, such as colleagues, the IT community and non IT community.
Quantitative Literacy (Numeracy)	Perform mathematical calculations and generate graphic representations to find computer-based solutions for professional practice.
Inquiry/Research	Demonstrate research and information literacy skills to locate, interrogate and evaluate relevant technical and scientific literature to develop specifications for computer science projects.
Critical thinking/analysis	Propose and analyse strategies using well known computer-based solutions to generate designs.
Creative problem solving/synthesis	Implement and evaluate solutions to unfamiliar, constructed and real world scientific and technical problems consistent with professional standards.
Teamwork	Contribute constructively in a team using team-building, self-assessment, negotiation and communication skills to complete professional projects.
Ethical awareness and professional conduct	Demonstrate awareness of appropriate social, legal, and ethical values that shape the work of an ICT professional.
Discipline-specific graduate capabilities	Apply fundamental computer science theory, analyse and extend computer-based solutions, and construct technical implementations to solve industry related problems.

# External reference points

Professional  
accreditation

National  
standards  
AQF

Discipline  
curriculum



**Careers that need to  
understand science**

***Know science***

Regulators

Science-related business

Policy development

Teaching

**Careers that  
use science**

***Use science***

Health

Engineering

Info Tech

Environmental Mgt

**Scientists**

***Create science***

Pure research

Applied research

# The shape of curriculum reform

## Scale



Single activity  
eg a new prac

Whole course  
revision

Whole of institution  
project  
eg introduce enquiry-  
based learning

## Objectives

- improve student learning outcomes
- Improve retention and progression
- structural reform
- rationalize resources