Tuning: The Ontario Experience Identifying and Measuring Sector-Based Learning Outcomes

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Tuning Workshop – A tool for developing competence based degree programs
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Higher Education Quality Council of Ontario
Informing the Future of Higher Education

Background and Rationale

- Parallel college and university sectors
- Parallel Quality Assurance Processes in Ontario are divergent
- Recognition and mobility a significant challenge
- Increased diversity of providers and program location

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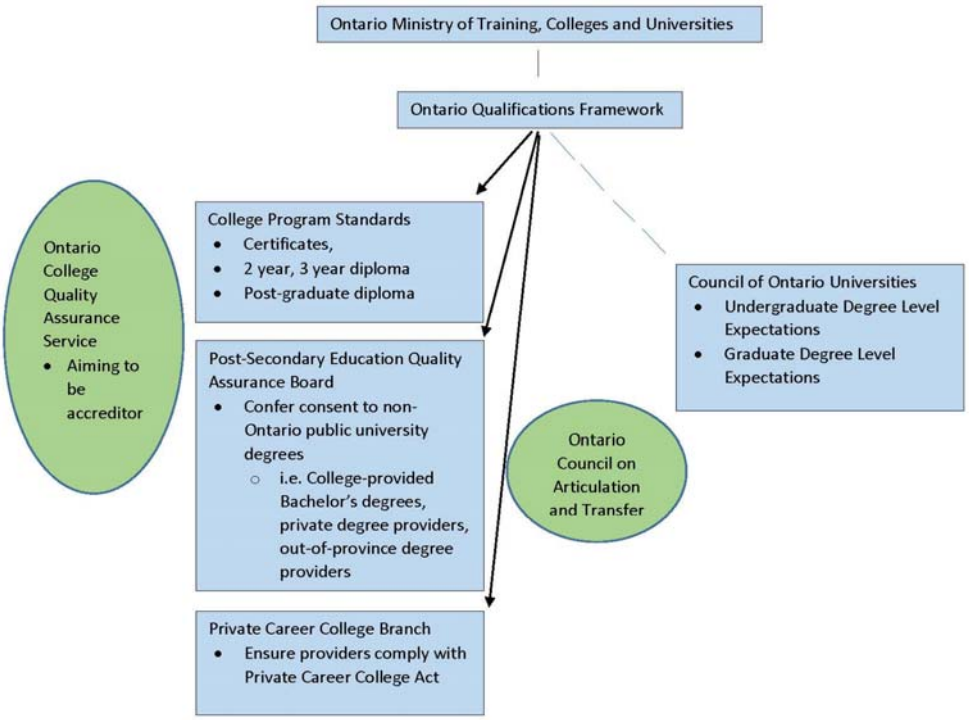
Ontario Quality Assurance System



Goals of Tuning Project

- Support institutions in demonstrating compliance with recognised frameworks
- Develop common language and understanding between college and university sectors
- Support the assessment and measurement of learning outcomes
- Provide transparent information on PSE options to students, the public and employers

Structure and Activities

- Sector-based learning outcomes
  - Social Sciences, Physical Sciences, Life and Health Sciences
- Across 2/3 year certificates, 4 year undergraduate degrees and research masters degrees
- Up to 12 individuals on each sector panel
  - Mix of faculty, students, and administrators from universities and colleges.
- Monthly face-to-face meetings of each panel
- Groups given full autonomy, with some guidance and rough deadlines
- Small advisory group provides guidance to entire project

Characteristics of qualification levels

CHARACTERISTICS	TWO-YEAR DIPLOMA	THREE-YEAR DIPLOMA	BACHELOR'S DEGREE	MASTER'S DEGREE
	Activities are well-defined and...	Activities are broadly-defined and...	Activities are complex and...	Activities are exploratory and...
PROCESSES AND SCOPE	...have clear constraints and processes, limited scope and involve unambiguous information	...involve adaptation/extension of standard processes; may have loose constraints and/or involve conflicting information	...require abstract thinking where processes are not immediately apparent; have a wide scope; often involve ambiguous or uncertain information	...require abstract thinking where processes are not immediately apparent; have an open scope; often involve unknown information and constraints
REQUIRED KNOWLEDGE BASE	...involve using limited theoretical knowledge but extensive practical knowledge	...involve extensive practical knowledge as it relates to fundamental theoretical knowledge	...involve a focus on theoretical knowledge as it relates to practical knowledge	...involve extensive and current theoretical knowledge related to the research area
INTERDEPENDENCE	...involve discrete and self-contained problems	...involve elements of extensive problems	...involve multiple elements or sub-problems which are interconnected	...involve the extension of interconnected ideas and concepts
INNOVATION	...involve the use of existing concepts or processes in modified ways	...involve the use of concepts or processes in non-standard ways	...involve the creative use of principles and research-based knowledge in novel ways	...involve the creation of new knowledge or novel application of existing knowledge to new areas
AUTONOMY	...have prescribed goals and methods; activities supervised	...have goals and method loosely prescribed and activities supervised	...require independent determination of processes and methods with periodic supervision	...involve conducting independent research with limited supervision

Characteristics of qualification levels (Two-year Diploma, Three-year Diploma, Bachelor's Degree, Master's Degree)

PROCESSES AND SCOPE | REQUIRED KNOWLEDGE BASE | INTERDEPENDENCE | INNOVATION | AUTONOMY

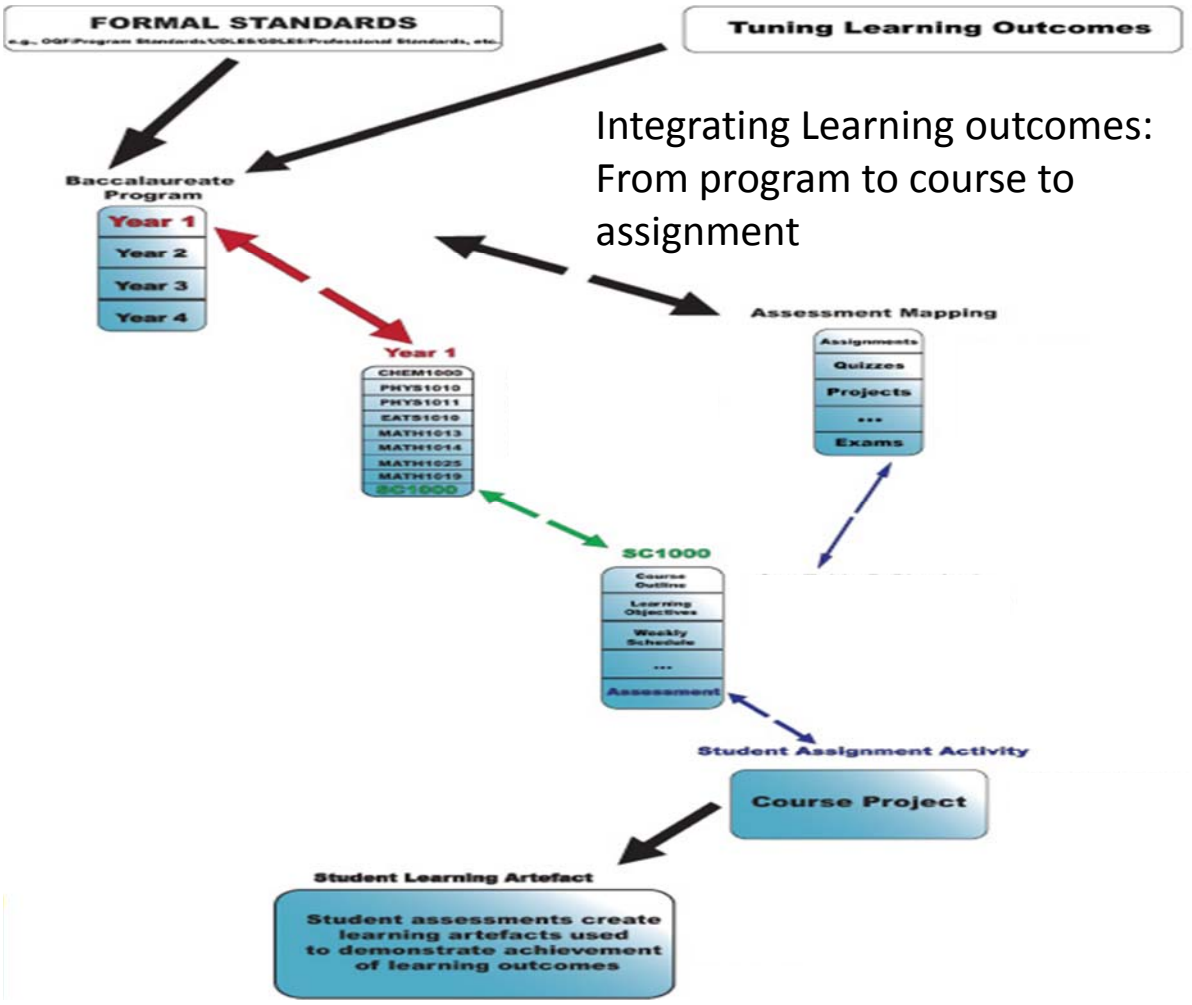
Competencies and learning outcomes

	COMPETENCIES	SUB-COMPETENCIES		
1	KNOWLEDGE	1.1 Theory and Concepts 1.2 Numeracy	1.3 Limits of Knowledge and Qualification 1.4 Multidisciplinary	1.5 Breadth of Knowledge
2	CRITICAL AND CREATIVE THINKING	2.1 Critical Thinking 2.2 Creativity	2.3 Problem Identification 2.4 Problem Solving	2.5 Compares and Contrasts Risks and Benefits 2.6 Evaluation
3	COMMUNICATIONS	3.1 Reading Comprehension 3.2 Effective Writing	3.3 Listening Comprehension 3.4 Presentation Skills	3.5 Effective Oral Communication Skills 3.6 Graphical Communications
4	SOCIAL RESPONSIBILITY	4.1 Ethical Principles and Guidelines 4.2 Social Awareness / Impact	4.3 Professional and Legal Responsibilities 4.4 Health and Safety	4.5 Environment and Sustainability
5	PERSONAL AND INTERPERSONAL	5.1 Diversity and Respect 5.2 Teamwork	5.3 Personal Reflection 5.4 Self-direction and Independent Work	5.5 Lifelong Learning
6	PRACTICE AND METHODS	**LIFE AND HEALTH SCIENCE** 6.1 Investigation / Research Methods 6.2 Resource Material 6.3 Formatting / Referencing 6.4 Practice 6.5 Ethical Research 6.6 Interdisciplinary Practice 6.7 Resource Management 6.8 Relevance of Research 6.9 Information Management	**PHYSICAL SCIENCE** 6.1 Tools, Instruments, and Equipment (Hardware and Software) 6.2 Design 6.3 Uncertainty 6.4 Troubleshooting 6.5 Models 6.6 Resource Management	**SOCIAL SCIENCE** 6.1 Information Management and Assessment 6.2 Ethics of Research 6.3 Research Methods 6.4 Methods of Analysis 6.5 Relevance of Research

Competencies and learning outcomes

1 KNOWLEDGE

SUBCOMPETENCY		TWO-YEAR DIPLOMA	THREE-YEAR DIPLOMA	BACHELOR'S DEGREE	MASTER'S DEGREE
1.1	Theory and Concepts	Describe and apply the key concepts, theories and practices in the discipline	Describe and apply major theories, principles and practices in the discipline	Drawing on fundamental principles, describe, apply and integrate major theories and practices in the discipline	Drawing on fundamental principles, describe, apply and integrate the major theories, research methods and approaches to inquiry and/or schools of practice in the field of study
1.2	Numeracy	Interpret quantitative information, apply quantitative reasoning and perform appropriate calculations to draw conclusions	Interpret quantitative information, apply quantitative reasoning and perform appropriate calculations to draw conclusions	Interpret quantitative information, apply quantitative reasoning and perform appropriate calculations to draw conclusions	Interpret quantitative information, apply quantitative reasoning and perform appropriate calculations to draw conclusions
1.3	Limits of Knowledge and Qualification	Describe limitations of personal knowledge and tasks for which they are qualified	Describe limitations of personal knowledge and tasks for which they are qualified	Describe the limits to their own knowledge and how uncertainty and ambiguity influences their analyses and interpretations	Delineate the current limits of theory, knowledge and/or practice in the field and how uncertainty and ambiguity influences analyses and interpretations
1.4	Multidisciplinary	Apply prescribed principles from related disciplines	Identify and apply principles from related disciplines	Identify and integrate principles from related disciplines	Identify and integrate principles of other fields of study in independent research
1.5	Breadth of Knowledge	Decribe and apply basic concepts theories and practices from across the sectors	Decribe and apply basic concepts theories and practices from across the sectors	Decribe and apply basic concepts theories and practices from across the sectors	Decribe and apply basic concepts theories and practices from across the sectors



Year		FIRST YEAR					
Curriculum Map for Tuning SLOs in Sample program		**Chemistry I**	**Physics I**	**Physics II**	**Earth & Space Science**	**Calculus I**	**Physical Science Project Course**
T=Taught, U=Utilized, A=assessed		*CHEM1000*	*PHYS1010*	*PHYS1011*	*EATS1010*	*MATH1013*	*SC1000*
Credits		3.0	3.0	3.0	3.0	3.0	6.0
1	**Knowledge**						
1.1	Theory and concepts	T,A	T,A	T,A	T,A	T,A	T,A
1.2	Numeracy	U	T,A	T,A	U	U	T,A
1.3	Limits of Knowledge & Qualification						T,A
1.4	Multidisciplinary		T,A	T,A		T,A	T,A
2	**Critical and creative thinking**						
2.1	Critical thinking	U	U	U	U	U	T,A
2.2	Creativity	T,A	T,A	T,A	T,A	T,A	T,A
2.3	Identify and define problem	T,A	T,A	T,A	T,A	T,A	T,A
2.4	Compare solutions and select approach	U	U	U	U	U	T,A
2.5	Risk mitigation						T,A
2.6	Evaluation						T,A

Engineering Practice 2012-2013			
Course learning outcomes (CLO): Students will be able to:			
1. Apply a prescribed process for solving complex problems (Tuning SLO 2.3, 2.4, 2.6 - Problem solving) 2. Select and apply appropriate quantitative model and analysis to solve problems. (Tuning SLO 6.6 - Models) 3. Effectively communicate in written document following a prescribed format (Tuning SLO 3.2) 4. Apply occupational health and safety principles, economics, law, and equity. (Tuning SLO 4.3, 4.4, 4.5) 5. Apply critical and creative thinking principles to solve problems. (Tuning SLO 2.1, 2.2) 6. Apply numerical modeling tool to create model used for solving complex problems. (Tuning SLO 6.6) 7. Critically evaluate information on prescribed criteria. (Tuning SLO 6.6)			
Week	**Instructional approach**	**Learning activity (student activity)**	**Evaluation**
1:Sep 10	Lecture: motivation, course overview, models, self-regulation.	In-lecture: 1. Opening problem, 2. Group activity to consider model for MEA1	Critical thinking pre-test **(CLO5)**
2:Sep 17	Lecture: complex problem solving and critical thinking overview, asking good questions	In-lecture: Group activity to develop process for resolving elevator failure problem	Occupational Health and Safety online test **(CLO4)**
3:Sep 24	Lecture: concept maps, establishing objectives and constraints, safety and hazard analysis. Concision.	In-lecture: Group activity to develop process for resolving complex problems	Studio: MATLAB quiz #2
4:Oct 1	Lecture: effective argumentation, brainstorming.	In-lecture: analyze past assignments for effective argument, group activity for MEA	Studio: MATLAB quiz #3
			Cable ferry failure assignment

Considering use of assessment tools

Mapping of assessment tools used in a hypothetical first year of a physical science program.										
	Case study	direct observation	examinations (unseen)	open book exam	collaborative group projects	essays	multiple choice tests	oral questioning after observation	performance projects	etc.
Chemistry I			X	X			X			
Physics I			X				X			
Physics II	X		X		X		Y		X	
Earth & Space Science			X			X	X			
Calculus I			X				X			
Calculus II			X	X			X		X	
Linear Algebra			X				X	X		
Discrete Mathematics			X				X			
Physical Science Project Course		X	X			X		X	X	

Demonstrating student achievement

- Creates record of student achievement and can providing student learning artifacts
- Linked to learning outcomes
- Useful to students and employers
- Options include:
  - Diploma supplement
  - Competency transcript
  - Badges and e-portfolios

Emerging Observations

- Consensus of what generic skills are, and the expectations achievement across credentials
- Importance of linking outcomes to assessment methods
- Expectation that this will support the entire system –student success, teaching and learning, and mobility,

Thank you!

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