SESSION 3: CURRICULUM MAPPING AND ASSESSMENT


ACRL standards.pdf
CDIO_syllabus_v2.pdf
Computing Curriculum 2005.pdf
Draft HEQCO Tuning learning outcomes.pdf
EC2000_Attributes.pdf
Guelph Senate - 05 Dec 2012 - Learning outcomes and rubric.pdf
Guidelines for making indicators.docx
Guidelines for making indicators.pdf
HEQCO Tuning Learning Outcomes Draft for Feedback.pdf
IEA-Grad-Attr-Prof-Competencies-v2.pdf
Ontario Qualifications Framework.pdf
Rose Hulman Institute Student...iteria Rubrics March 2010 (2).pdf
SE UUDLES.pdf
Software Eng Curriculum 2004.pdf
UCR Session 2.pdf
Undergraduate Degree Level Expectations - Space Engineering.pdf

Curriculum Mapping

Where are attributes/ indicators developed?

Where are attributes/ indicators assessed?

CEAB Reporting requirement

Instructions:	List all learning activities (courses etc) that relate to specific graduate attributes. Highlight those activities where student achievement has been, or is planned to be, assessed. *Please delete the sample entries and highlighting to use this table.*
Table 3.1.1:	Summary Graduate Attribute Curriculum Map

Graduate Attribute	Semester							
	1	2	3	4	5	6	7	8
Knowledge base	CHEM101	PHYS102	MATH201	MATH202	MATH301	DSPE302	DSPE401	DSPE402
	MATH101	MATH102	MATH203	ENGR202	DSPE301	DSPE304	DSPE403	DSPE404
	ENGR101	ENGR102	ENGR201	NSCI202	DSPE303	DSPE306	DSPE405	DSPE406
	ENGR103	CMPT102	NSCI201	NSCI204	DSPE305			
			DSPE201	DSPE202				
			STAT201					
Problem analysis	ENGR103		DSPE201		DSPE303	DSPE302	DESX401	
					DSPE305	DSPE306	DESX403	
Investigation				ENGR202		DSPE302	DESX401	
				DSPE202			DESX403	
Design	DESX101	DESX102			DESX301	DESX302	DESX401	DESX402
					DSPE303	DSPE304	DESX403	DESX404
							DSPE405	DSPE406
Use of engineering tools		ENGR102			DSPE301	CO-OP	DSPE401	
		CMPT102			CO-OP		DESX401	
							DESX403	
Individual and team work	DESX101	DESX102			DESX301	DESX302	DESX401	DESX402
					CO-OP	CO-OP	DESX403	DESX404
Communication skills	ENCS101	ENCS102		ENCS202	DSPE303	DESX302	ENCS401	DESX402
	DESX101	DESX102			CO-OP	CO-OP		DESX404

CEAB: Course learning outcomes

Appendix 6C - Course Information Sheet

Instructions:	To be completed for every compulsory and elective course. Data used to validate input is stored in columns P-X of this worksheet. Macros are provided to add learning instructors, outcomes, texts and laboratory content. ADDING OR DELETING ROWS IN ANY OTHER WAY WILL INVALIDATE THIS WORKSHEET.
Course number:	CS_ELECT
Course title:	Complementary Studies Elective
Calendar web link:	
*Notes:	

* Provide explanatory notes on inconsistencies with calendar information (if applicable)

CEAB course type		CEAB curriculum category ntent		Math		Natural science		Complementary studies		Engineering science		Engineering design	
	E	AU percentage:		0%		0%		100%		0%		0%	
Compulsory	Elective	Total:	36					36					

CEAB graduate attribute content** (content code):	1 KB	2 PA	3 Inv.	4 Des.	5 Tools	6 Team	7 Comm.	8 Prof.	9 Impacts	10 Ethics	11 Econ.	12 LL
							I	I	I	I	I	I

** Enter content code most appropriate for each attribute

Content level codes: blank = not applicable (less than 2 AU); I = introduced (introductory); D = developed (intermediate); A = applied (advanced)

Professor-in-charge : (name, reg-status, PhD, acad. rank)					All other instructor(s): (name, reg-status, PhD, acad. rank)				
Family name	Initial(s)	L. Status	Doctorate	Acad Rank	Family name	Initial(s)	L. Status	Doctorate	Acad Rank
tba		Unknown	Unknown	Unknown					

Course delivery and outcomes:	Total instructional hours per week	Hours per section		Total num. sections		Teaching assistants		Average grade		Failure rate (%)
		Lecture	Lab/tut	Lecture	Lab/tut	Number	Hours	%	Letter	
	3	3.0	0.0	1	0	0	0.0		B	1-2

Major learning outcomes:	Learning outcome indicators
	1
	2
	3
	4
	5
	6

Process Tool: Curriculum map

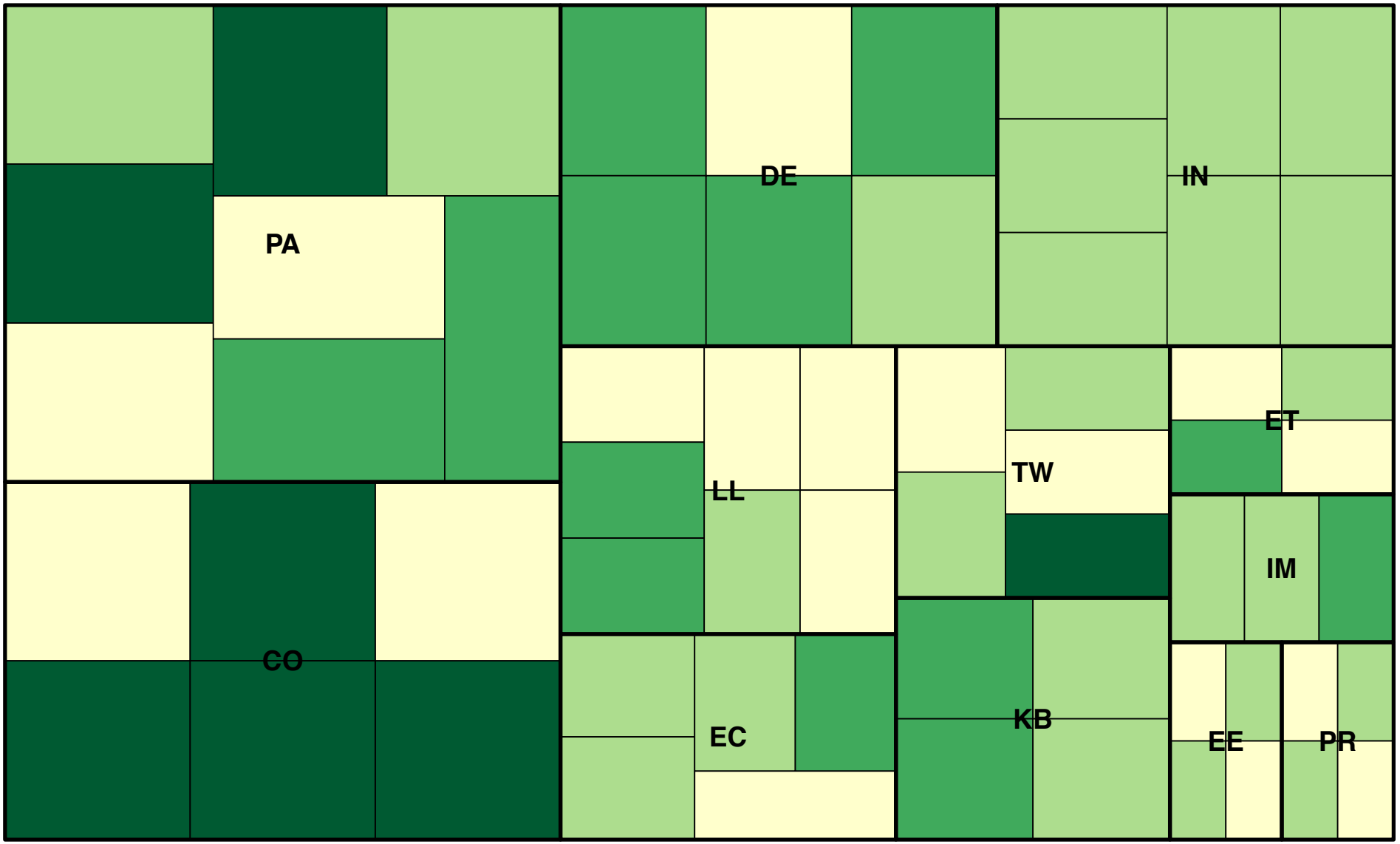
	APSC 100	APSC 111	APSC 131	APSC 151	APSC 161	APSC 171
Problem Analysis (APSC-PA-xx-01)	Develop, Assess	-	Develop, Assess	Develop, Assess	Assess	-
Design (APSC-DE-xx-02)	Develop, Assess	-	-	Assess	-	-
Communication (APSC-CO-xx-02)	Develop, Assess	-	Assess	Develop, Assess	-	-
Impact of Engineering (APSC-IM-xx-03)	Develop, Assess	-	Assess	Assess	-	-

Questions for mapping

- What are your course learning outcomes? (**What**)
- Does your course specifically develop the CLO? (**How**)
- Which Program level learning outcomes (indicators/GA's) map to your CLOs (**What**)
- What are your assessments? (**How**)
- When do these occur? (**When**)
- Which CLOs map to which assessment? (**Where**)
- What is the type of each assessment? (**What**)
- What is the complexity of the assessment? (**Complexity**)
- What scaffolding is provided in the assessment? (**Scaffolding**)
- How long between instruction and assessment of CLO? (**How**)
- Who assesses student work? (**Who**)
- What are the expectations for achieving the outcome? (**Expectations**)

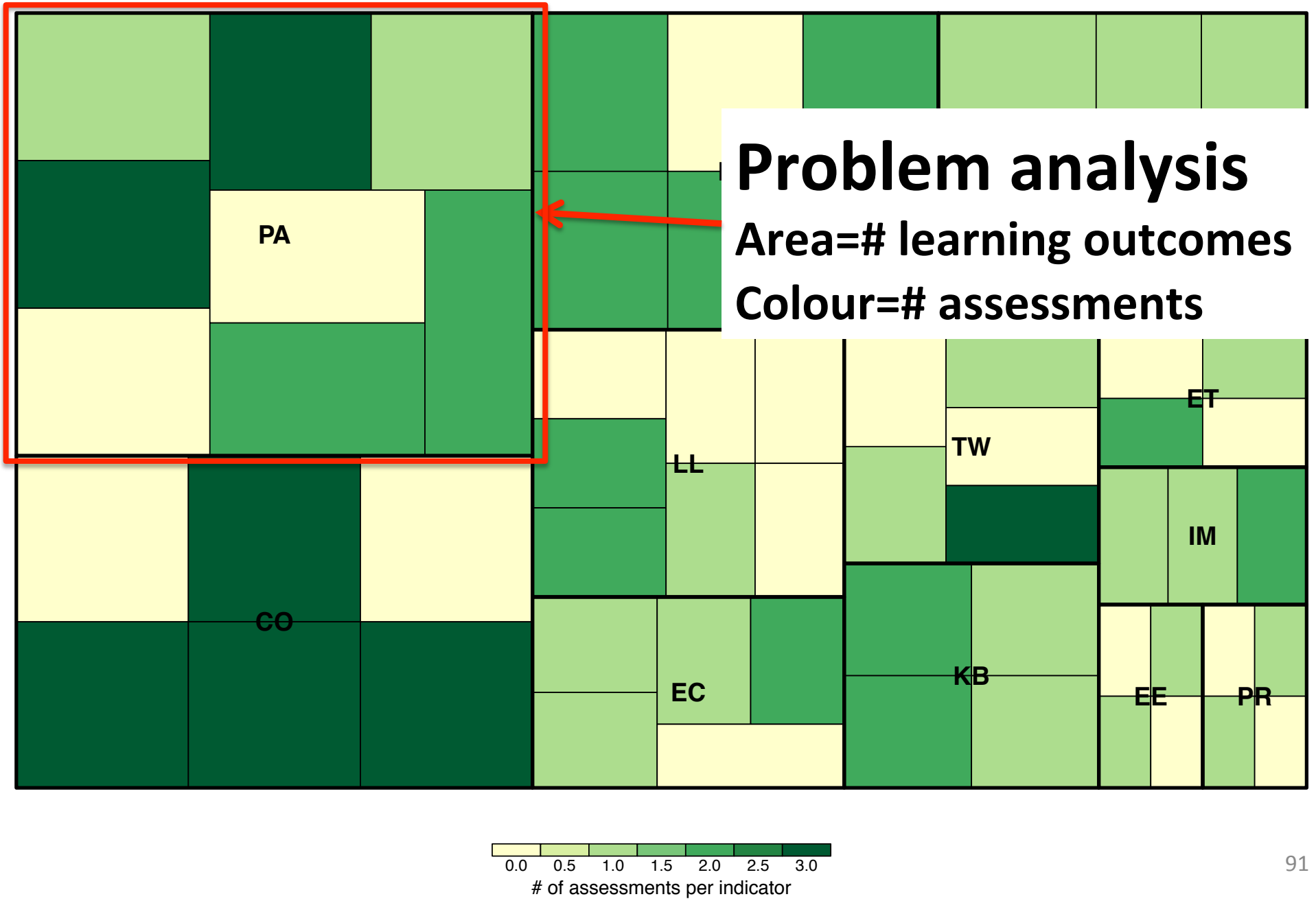
Visualizing the curriculum

First Year Curriculum Treemap, Area = # of assessments per attribute



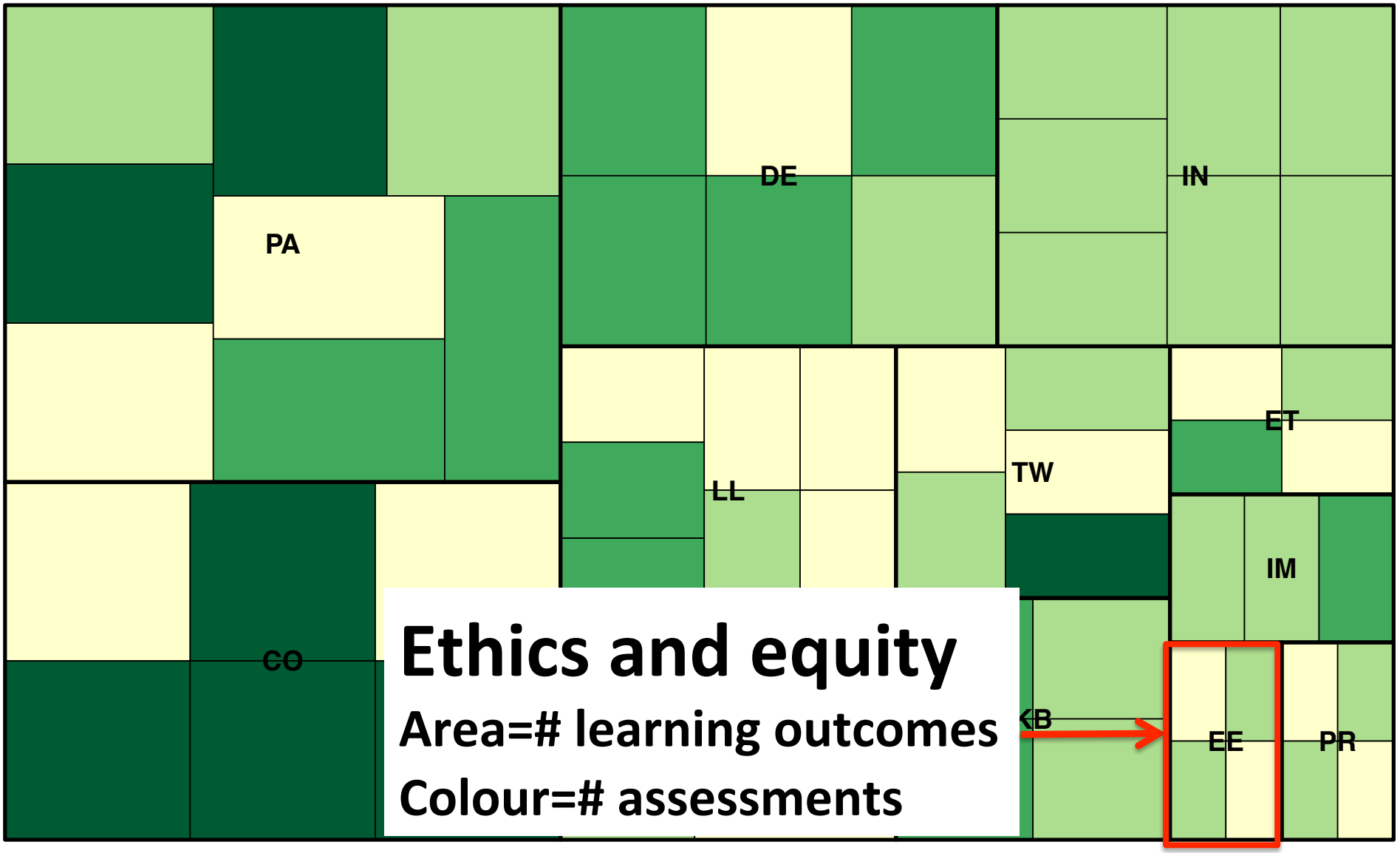
Visualizing the curriculum

First Year Curriculum Treemap, Area = # of assessments per attribute



Visualizing the curriculum

First Year Curriculum Treemap, Area = # of assessments per attribute



Your turn: As a program, create a plan for developing/enhancing curriculum map

If no current curriculum map:

Who needs to be involved in creating it?

Process for creating curriculum map – representatives from key areas in department?

If map exists:

Is there consensus among the department about the map?

Are there gaps in the map?

Where are indicators assessed?

ASSESSMENT PLANNING

Why not use grades to assess outcomes?

Student transcript

Electric Circuits I	78
Electromagnetics I	56
Signals and Systems I	82
Electronics I	71
Electrical Engineering Laboratory	86
Engineering Communications	76
Engineering Economics	88
...	
Electrical Design Capstone	86

Course grades usually aggregate assessment of multiple objectives, and are *indirect* evidence for *some* expectations

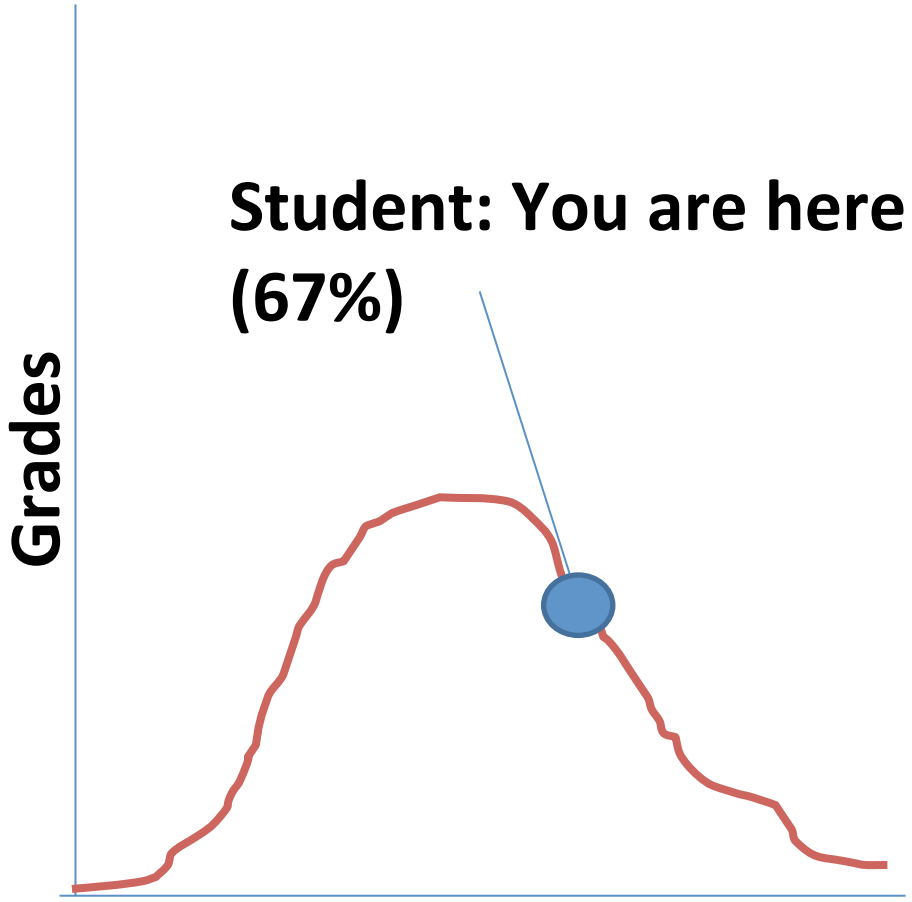
How well does the program prepare students to solve open-ended problems?

Are students prepared to continue learning independently after graduation?

Do students consider the social and environmental implications of their work?

What can students do with Knowledge? Can they communicate effectively?

Norm referenced evaluation

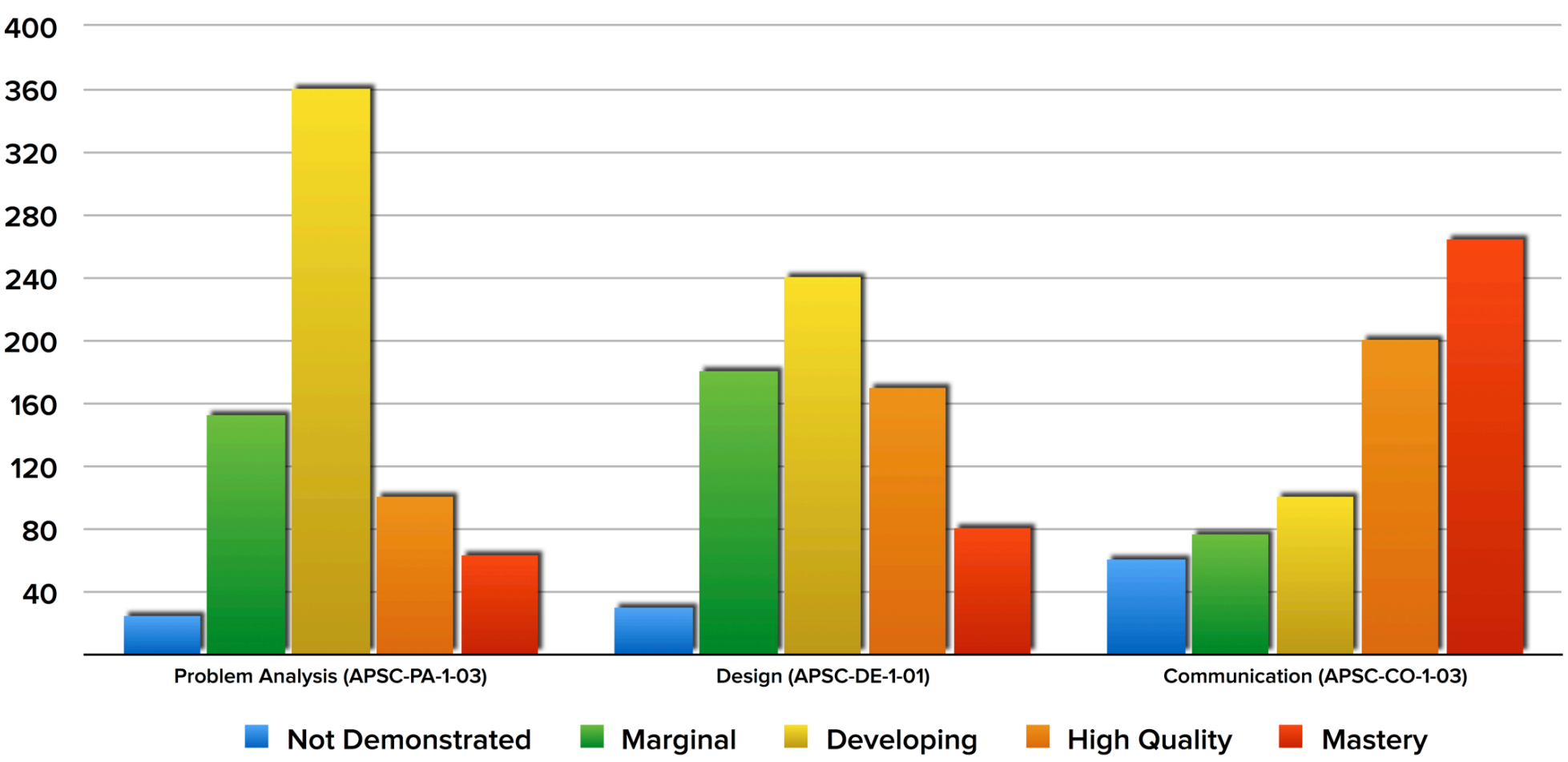


Used for large scale evaluation to compare students against each other

Criterion referenced evaluation

"Student has marginally met expectations because submitted work mentions social, environmental, and legal factors in design process but no clear evidence of that these factors impacted on decision making."

Used to evaluate students against stated criteria. Useful for feedback to student and conversation within a program



	Not Demonstrated (0-3)	Marginal (4)	Developing (5)	High Quality (6)	Mastery (7-8)
Problem Analysis (APSC-PA-1-03)	Unsupported or trivial arguments	Arguments weak overall	Arguments include some but not all critical elements	Makes claims supported by data and backing, with appropriate qualifiers	**Meets expectations and:** Claims supported…
Design (APSC-DE-1-01)	No or inadequate process described	Process identified, misses critical factors.	Process is clear but missing some elements	Creates justified process for solving problem..	**Meets expectations and:** Comprehensive process…
Communication (APSC-CO-1-03)	Report difficult to understand	Understandable but not formatted…	Clearly formatted following guidelines …	Concise and clearly formatted….	**Meets expectations and:**Varied transitions…

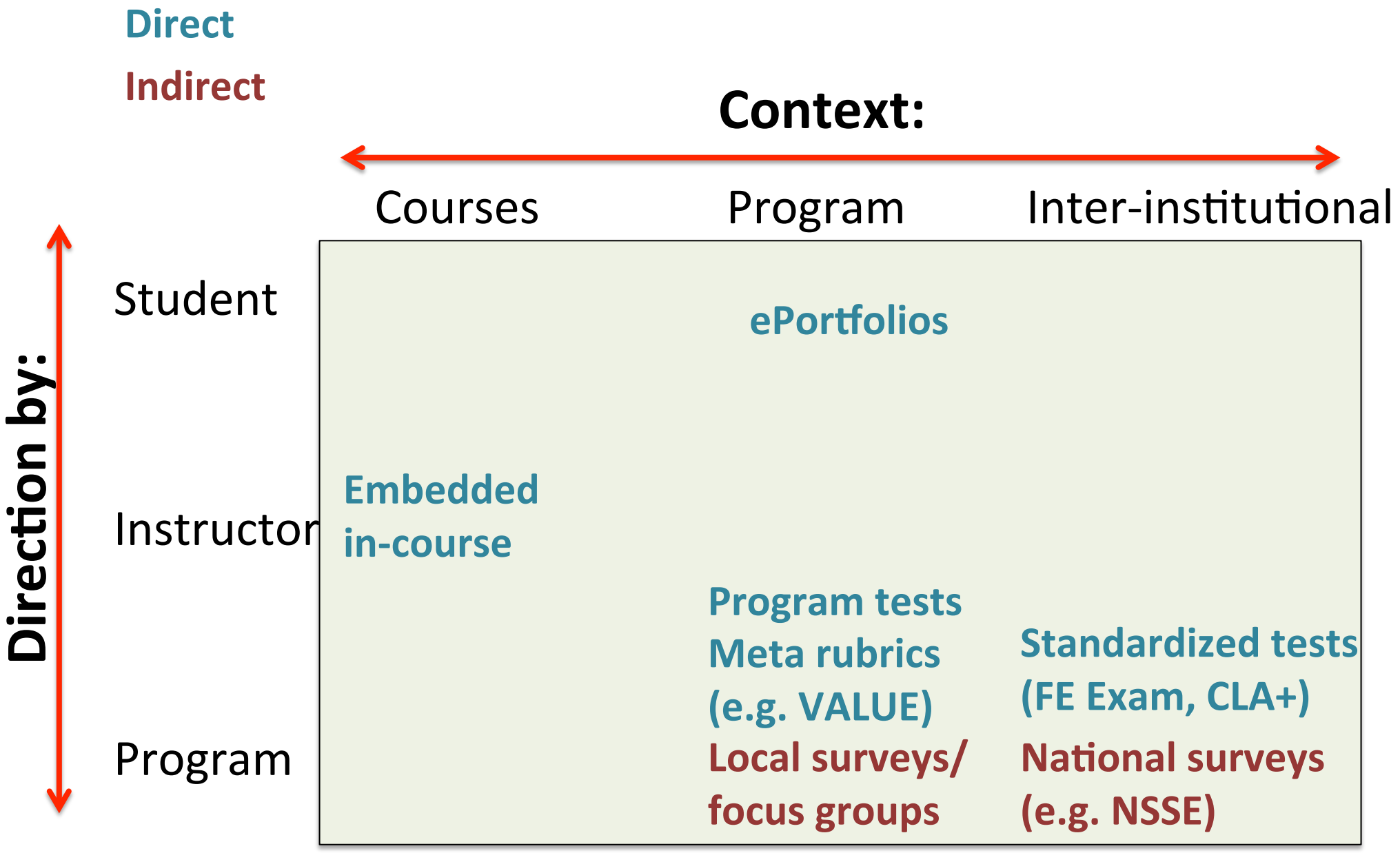
CEAB Reporting Requirement – Assessment tools

Instructions: Provide examples of the assessment tools (rubric or other) used to comparatively evaluate performance for any 12 indicators listed in Table 3.1.2. At least one indicator for each of the 12 attributes must be included. Change column headings as required. Add or delete columns as required. Provide performance descriptors that exactly correspond to those used in assessment. A complete set of all assessment tools should be available to the visiting team at the time of the visit.
Please delete the sample entries and highlighting to use this table. If a program uses a different number of levels of performance than what is in the example, columns may be added or deleted. The example shows four levels of achievement but this can be modified to suit the program.

Table 3.1.3: Examples of Assessment Tools

Graduate Attribute	Performance level	Level 0	Level 1	Level 2	Level 3
	Level descriptor	*Fails to meet expectations*	*Minimally meets expectations*	*Adequately meets expectations*	*Exceeds expectations*
Knowledge base	*Recalls and describes fundamental concepts in chemistry*	*Less than 50% on final examination*	*50% to 60% on final examination*	*60% to 80% on final examination*	*Greater than 80% on final examination*
Problem analysis	*Creates process for solving problem including approximations and assumptions*	*Process unacceptable and treatment of approximations and assumptions inadequate*	*Process acceptable but treatment of approximations and/or assumptions marginal*	*Process and treatment of approximations and assumptions acceptable*	*Process and/or treatment of approximations and assumptions exceptional*
Investigation	*Indicator:*	*Performance descriptor*	*Performance descriptor*	*Performance descriptor*	*Performance descriptor*
Design	*Indicator:*	*Performance descriptor*	*Performance descriptor*	*Performance descriptor*	*Performance descriptor*
Use of engineering tools	*Indicator:*	*Performance descriptor*	*Performance descriptor*	*Performance descriptor*	*Performance descriptor*

Programmatic assessment approaches



Process tool: Assessment plan

Attribute	Course level assessment	Program level assessment	
		Direct methods	Indirect methods
Problem analysis	Project 1 & 2	Standardized Instrument	Graduating student survey Faculty Survey
Design	Project 1 & 2	Standardized Instrument	Graduating student survey Faculty Survey
Communications	Project 1 & 2	Standardized Instrument Program-wide Rubric	NSEE Graduating student survey Faculty Survey
Lifelong learning	Project 1 & 2		NSEE Graduating student survey Faculty Survey

TASK: Data audit

DURATION: 10 MINUTES

In a team, select identify data that already exists, or is already being collected, that provide direct or indirect evidence of competence:

1. Surveys/focus groups
2. Research studies in engineering or broadly at university
3. Data already being collected in courses
4. Internship/exchange
5. Admissions data
6. Graduating student surveys, alumni surveys
7. Graduate completion rates
8. …

Assessment Tools

How to measure learning against specific expectations?

Direct measures – directly observable or measurable assessments of student learning

- E.g. Student exams, reports, oral examinations, portfolios, concept inventories etc.

Indirect measures – opinion or self-reports of student learning or educational experiences

- E.g. grades, surveys, focus group data, graduation rates, reputation, etc.

What to look for in assessment tools

1. **Workload:** Results in a feasible workload for students and graders
2. **Generalizability:** Results are representative of entire program/class
3. **Content:** The assessment tool is clearly aligned with the outcome
4. **Reliability:** Results will be consistent between graders, or if tested again
5. **Actionable:** Provides useful information related to educational experience that can be used for course and/or program improvement

Selecting Assessments

- Looking for assessments that are:
  - **Valid**: they measure what they are supposed to measure
  - **Reliable**: the results are consistent; the measurements are the same when repeated with the same subjects under the same conditions
- Capitalize on what you are already doing
- Look for "leading Indicators"
- One approach for dealing with qualitative assessments (not the only!) is with **Rubrics**

Examples of assessment tools

- Local written exam (e.g. question on final)
- Standardized written exam (e.g. Force concept inventory)
- Performance appraisal (e.g. Lab skill assessment)
- Simulation (e.g. Emergency simulation)
- Behavioural observation (e.g. Team functioning)
- Portfolios (student maintained material)
- External examiner (e.g. Reviewer on design projects)
- Oral exam (e.g. Design projects presentation)
- Oral interviews
- Surveys and questionnaires
- Focus group
- Archival records (registrar's data, records, ...)

TASK: Selecting assessment in a course

DURATION: 20 MINUTES

In a team, pick a course (first year design, electrical, mechanical, or chemical), and select assessment tools appropriate to the course learning outcomes, considering:

1. **Workload:** Results in a feasible workload for students and graders
2. **Generalizability:** Results are representative of entire program/class
3. **Content:** The assessment tool is clearly aligned with the outcome
4. **Reliability:** Results will be consistent between graders, or if tested again
5. **Actionable:** Provides useful information related to educational experience that can be used for course and/or program improvement

Discussion

- Formative/summative assessment
- Linkage between outcomes and topics
- Workload
- Generalizability
- Content alignment
- Reliability
- Actionability

Example: First year design course

APSC 100 Course Outcomes	
	1. Apply a general process for solving complex problems. (APSC-DE-1-01) 2. Select and apply appropriate quantitative model and analysis to solve problems. 3. Effectively communicate following a prescribed format, using standard grammar and mechanics. (APSC-CO-1-03) 4. Apply concepts including occupational health and safety principles, economics, law, and equity to engineering problems. (APSC-IM-1-03) 5. Apply critical and creative thinking principles to solve contextualized problems. (APSC-PA-1-03) 6. Apply a numerical modelling tool to create a model used to solve complex problems

	Teaching	Activity	Assessment
Week 1	**Motivation:** course overview and structure	Critical Thinking Pre-test	Word/Excel assignment (CLO 3)
Week 2	**Models:** Mini MEA1 **Goal:** what is a model (drawing, text, equations describing behaviour), and using MATLAB script as part of a model	Intro to MATLAB: Starting MATLAB, variables, operations, plotting, scripts, and publishing a MATLAB script.	Mini MEA1 to be done by end of lecture (CLO 2,5,6)
Week 3	**Argumentation:** analyze past assignments for effective argumentation **Goal:** Create argument related to MEA1. Process for creating reports	Conditional statements	
Week 4	**Complex problem solving:** Complex problem solving process. **Goal:** Identify stakeholders and asking relevant questions for MEA1	Curve fitting and interpolation	MEA 1 Draft Submission (CLO 1,2,3,5,6)

First year design course project rubric

	Not Demonstrated	Marginal	Developing	Expectation	Outstanding
	0-3	4	5	6	7-8
Problem Definition	Problem not defined, little useful information, or information directly copied.	Some important information or biases not identified, or trivial/incorrect information included.	Problem definition is clear but missing some elements.	Clearly defines scope of problem, stakeholders, and required goals. Summarizes and assesses credibility of information used.	**Meets expectations and**: Includes information from authoritative sources to inform process, model, and conclusions.
Proposed Process (APSC-DE-1-01)	No or inadequate process described	Process identified misses critical factors; some assumptions left unidentified or unjustified.	Process is clear but missing some elements	Creates justified process for solving problem, including tests/investigation, supported by information.	**Meets expectations and:** Comprehensive process described with multiple possible approaches described and compared.
Model	No analysis, or model/ analysis selected is inappropriate, or can't draw conclusions	Model used has significant errors or uses inappropriate assumptions.	Model has minor errors or unsupported approximations or assumptions	Creates and applies quantitative model using supported analysis, approximations and assumptions.	**Meets expectations and:** Sophisticated model used incorporating several effects; uncertainty in model's input variables shown by range of output values
Conclusions	No evaluation of solution.	Superficial evaluation of solution and superficial recommendations to prevent future failures	Most of the elements under "expectation" met, but not all	Evaluates validity of results and model for, drawing well-supported conclusions about causes of failure and supported recommendations for to prevent future failures.	**Meets expectations and:** Quantifies possible error/ uncertainty in model conclusions and provides multiple thoughtful recommendations prevent future failures.
Argumentation (APSC-PA-1-03)	Unsupported or trivial arguments	Arguments weak overall	Arguments include some but not all critical elements	Makes claims supported by data and backing, with appropriate qualifiers	**Meets expectations and:** Claims supported by authoritative backing and comprehensive description of context in which they apply.
Communication (APSC-CO-1-03)	Report difficult to understand	Understandable but not formatted following guidelines; many grammatical errors	Clearly formatted following guidelines but obviously needs proofreading	Concise and clearly formatted following guidelines with few grammatical errors	**Meets expectations and:**Varied transitions, attractively formatted, no grammatical errors

Part 1: Group 1 – Design course assessment

Course: Introduction to Design and professionalism

Course learning outcomes (CLOs): Students will be able to:

1. Apply a prescribed process for solving complex problems *(Indicator: 2.3, 2.4, 2.6 - Problem solving)*
2. Effectively communicate in written document following a prescribed format and using standard English. *(Indicator: 7.1 - Effective writing)*
3. Apply concepts including occupational health and safety principles, economics, law, and equity to engineering problems. *(Indicator 4.3, 10.1, 11.1)*
4. Apply critical and creative thinking principles to solve contextualized problems *(Indicator: 2.7)*
5. Apply numerical modeling tool to create model used for solving complex problems.
6. Critically evaluate information on prescribed criteria *(Indicator: 12.1)*.

Week	Key concepts	Student activity	Assessment
1	Motivation, course overview, models.	Lecture group activity: what is a model?	
2	Complex problem solving process	Accident investigation activity: Part 1	
3	Stakeholders and constraints	Accident investigation activity: Part 2	
4	Argumentation	Practicing oral presentations	
5	Teaming	Teaming and conflict resolution activities	
6	Idea generation	Brainstorming activity	
7	Decision making	Evaluation matrix activity	
8	Safety and hazard analysis	Hazard analysis	
9	Evaluating Information	Team evaluation of information sources	
10	Professionalism and ethics	Ethical dilemma	
11	Engineering Law	Case study: negligence	
12	Economics	Time value of money activity	
13	Design process	Applications of course to client projects	

	COURSE MAPPING: FIRST YEAR DESIGN	FALL					WINTER				
Indicator Code	Indicator	Excel/Word	Report 1	Report 2	Interview of engineer	Phase 2	Phase 3	Phase 4	Proposal presentation	Final presentation	Individual assessment
Indicator	**Individual and teamwork**										
APSC-TW-_-	Describes own temperament and analyzes impact of own temperament on										
APSC-TW-_-	Applies principles of conflict management to resolve team issues.										X
APSC-TW-_-	Exercises initiative and participates equitably, including participating actively										X
APSC-TW-_-	Establishes team contract around behaviour, expectations, and timelines.		X	X							
Indicator	**Communications**										
APSC-CO-_-02	Summarizes and paraphrases written work accurately.					X	X				
APSC-CO-_-03	Effectively communicates technical information following a prescribed	X	X	X		X	X	X			
APSC-CO-_-04	Delivers clear and organized formal presentation following established								X	X	
APSC-CO-_-06	Constructs effective figures, tables, and drawings employing standard	X					X	X			
Indicator	**Professionalism**										
APSC-PR-_-01	Describes role of protection of the public and public interest in decision										
APSC-PR-_-02	Demonstrates punctuality, responsibility and appropriate communication										X
APSC-PR-_-03	Applies professional codes of ethics and engineering standards to			X							
Indicator	**Impact of engineering**										
APSC-IM-_-03	Devises solutions for engineering problems that incorporate technical, social,							X			
Indicator	**Ethics and equity**										
APSC-EE-_-01	Demonstrates behaviour congruent with academic integrity expectations of										
APSC-EE-_-02	Recognizes and resolves ethical dilemmas based on ethical principles and			X							
APSC-EE-_-03	Describes ethical issues and impact on stakeholders (individual, the		X	X							
APSC-EE-_-04	Describes consequences of deviating from professional codes of conduct and										
Indicator	**Economics**										
APSC-EC-_-01	Plans and efficiently manages time and money.							X			
APSC-EC-_-02	Establishes appropriate project scope, after consultation with client, based										

Case 2: Assessment in a Chemical Engineering course

Scenario: The following is a third year Chemical Engineering course, Chemical Reaction Engineering. Your group is the instruction team responsible for ensuring that the course activities align with program-wide indicators, and can provide useful data. A previous course instructor has worked with the departmental curriculum committee on the course learning outcomes and their connection to program-wide indicators (shown below in italics). Note that the indicators to which the learning outcomes connect are not described. You do not need to worry about the indicators for this activity.

You have been asked to propose specific assessments (under the "Assessment" column) to ensure that data is gathered to inform both course and program improvement. You are free to assess multiple learning outcomes per assessment. You should consider the following:

(1) **Workload:** Results in a feasible workload for students and graders
(2) **Generalizability:** Results are representative of entire program/class
(3) **Content:** The assessment tool is clearly aligned with the outcome
(4) **Reliability:** Results will be consistent between graders, or if tested again
(5) **Actionable:** Provides useful information related to educational experience that can be used for course and/or program improvement

Course: Chemical Reaction Engineering

Course learning outcomes (CLOs): Students will be able to:

1. Calculate operating parameters (size, flowrates, conversion, etc.) for isothermal and non-isothermal operation of ideal well- mixed batch and continuous reactors, and for ideal plug-flow reactors *(Indicator 1.10, 1.12)*
2. Formulate a set of consistent material and energy balance equations to describe operation of batch, semi-continuous and continuous reactor systems with single or multiple reactions
3. Formulate an overall rate expression from a series of elementary mechanistic steps
4. Investigate the choice of reactor type and operating conditions on output such as reactant conversion, selectivity and yield. *(Indicator 1.11)*
5. Demonstrate ability to take leader role on a team project *(Indicator 6.3)*

Week	Key concepts	Student activity	Assessment
1-2	Reaction rates, stoichiometry		
3-5	Isothermal reactors, reversible reactions		
6-8	Nonisothermal reactor design		
9-11	Multiple reactions, selectivity and yield		
12	Reaction networks and pathways		
13	Reactor design challenge		

Part 1: Group 3 – Electrical Engineering

Course: Electronics I

Course learning outcomes (CLO): Students will be able to:

1. Select and use a small signal model to predict behaviour of common nonlinear active devices *(Indicator 1.8)*
2. Calculate current and voltage at nodes of non-linear devices when connected using common bias networks.
3. Calculate component values to implement common amplifier configurations *(Indicator 1.9)*
4. Select and design an electronic circuit (in this course, an amplifier) for a specific real-world application *(Indicator 4.3)*

Week	Key concepts	Student activity	Assessment
1	Motivation, connection to passive electric circuits	Electronics concept inventory pre-test	
2	Two terminal and three terminal active devices (diodes and transistors). Non-linear vs linear.	Team problem solving, followed by computer-based quiz question.	
3	Applications for two terminal devices	Team project planning: Identify requirements of project	
4	Applications and characteristics of amplifiers.	Team problem solving, followed by computer-based quiz question.	
6-7	Operation and behaviour of operational amplifiers. Applications.	Hand-in homework	
8-9	MOSFET amplifiers (CS, CG, CD)	Hand-in homework	
10-11	Bipolar amplifiers (CE, CC, CB)	Hand-in homework	
12	Nonlinear behaviour of transistors		
13	Design considerations, practical limitations of common devices.	Electronics concept inventory post-test	

ELEC-252 2013-2014 || Weekly overview

Course learning outcomes (CLO): Students will be able to:

1. *Select and use a small signal model to predict behaviour of common nonlinear active devices
2. Calculate current and voltage at nodes of non-linear devices when connected using common bias networks using large signal model
3. *Calculate component values to implement common amplifier configurations
4. In a small team, select and design an appropriate amplifier topology for a real-world application

Pre-class: A pre-class reading or learning activity will be assigned before most lectures and studios. A short quiz will be held at the beginning of the tutorial each week on the pre-class readings.

Week	Lecture approach and content	Tutorial approach and content	Assessment (CLO, and % of course grade)
1:Sep 9	Motivation for the course, course overview, academic integrity expectations, group-based clicker problems.	Electronics concept inventory pre-test (same test to be given at end of course)	***Electronics concept inventory pre-test*** targeting CLO 1,2,3 (worth 1% of course grade)
2:Sep 16	Two terminal and three terminal active devices (diodes and transistors). Non-linear vs linear devices, applications. Group and individual clicker questions.	Team problem solving, followed by computer-based quiz question.	***In-tutorial computer-based quiz*** *targeting CLO 1 (worth 4% of course grade)*
3:Sep 23	***Lecture:*** Applications and characteristics of amplifiers.	Team project planning: Identify requirements of project, power requirements, frequency range	
4: Sep 30	***Lecture: ...***	Team problem solving, followed by computer-based quiz question.	***In-tutorial computer-based quiz*** *targeting CLO 1 (worth 4% of course grade)*
6: Oct 14	***Lecture:***	...	***Midterm exam:*** *2 questions will target CLO1 (worth 20% of course grade)*
...	...	...	...
12:	...	...	***Final team project:*** *targets CLO4 (worth 10% of course grade)*
EXAM			***Final exam:*** *Two questions will target each CLO (worth 50% of course grade)*

TASK: Assessing indicators

DURATION: 30 MINUTES

Your team is asked to create a reliable method of assessing one indicator.

Part I:

1. Select an indicator, and select and describe an assessment measure (exam question, design report, simulation, etc.)
2. Make two short statements, suitable for a rubric (next slide) describing characteristics typical of
   a. high quality work, and
   b. low quality work.

Part II: We will pass ideas to another team for feedback on the basis of the 5 assessment principles.

	Not Demonstrated	Marginal	Developing	Expectation	Outstanding
	0-3	4	5	6	7-8
Problem Definition	Problem not defined, little useful information, or information directly copied.	Some important information or biases not identified, or trivial/incorrect information included.	Problem definition is clear but missing some elements.	Clearly defines scope of problem, stakeholders, and required goals. Summarizes and assesses credibility of information used.	**Meets expectations and**: Includes information from authoritative sources to inform process, model, and conclusions.
Proposed Process (APSC-DE-1-01)	No or inadequate process described	Process identified misses critical factors; some assumptions left unidentified or unjustified.	Process is clear but missing some elements	Creates justified process for solving problem, including tests/investigation, supported by information.	**Meets expectations and:** Comprehensive process described with multiple possible approaches described and compared.
Model	No analysis, or model/ analysis selected is inappropriate, or can't draw conclusions	Model used has significant errors or uses inappropriate assumptions.	Model has minor errors or unsupported approximations or assumptions	Creates and applies quantitative model using supported analysis, approximations and assumptions.	**Meets expectations and:** Sophisticated model used incorporating several effects; uncertainty in model's input variables shown by range of output values
Conclusions	No evaluation of solution.	Superficial evaluation of solution and superficial recommendations to prevent future failures	Most of the elements under "expectation" met, but not all	Evaluates validity of results and model for, drawing well-supported conclusions about causes of failure and supported recommendations for to prevent future failures.	**Meets expectations and:** Quantifies possible error/ uncertainty in model conclusions and provides multiple thoughtful recommendations prevent future failures.

TASK: Assessing indicators

DURATION: 30 MINUTES

Part II: Exchange your proposal with another team for feedback. The feedback team should evaluate on:

1. **Workload:** Results in a feasible workload for students and graders
2. **Generalizability:** Results are representative of entire program/class
3. **Content:** The assessment tool and descriptor is clearly aligned with the outcome
4. **Reliability:** Results will be consistent between graders, or if tested again
5. **Actionable:** Provides useful information related to educational experience that can be used for course and/or program improvement

Part III: Provide your thoughts and possible recommendations to the team

TASK: Assessing indicators

DURATION: 15 MINUTES

Part III: Present your indicator, assessment method, and descriptions of high and low quality work using feedback from the review team.

Would you change your indicator/assessment method/ descriptors?

1. **Workload:** Results in a feasible workload for students and graders
2. **Generalizability:** Results are representative of entire program/class
3. **Content:** The assessment tool and descriptor is clearly aligned with the outcome
4. **Reliability:** Results will be consistent between graders, or if tested again
5. **Actionable:** Provides useful information related to educational experience that can be used for course and/or program improvement

First year design course data

Outcome	Task-specific rubric descriptors				
	Not demonstrated	**Marginal**	**Developing**	**High quality**	**Mastered**
Problem definition: Accurately defines a problem, including significance, stakeholders, and client needs.	Problem not sufficiently defined …	Problem definition somewhat unclear, trivial/incorrect information included…	Problem definition is generally clear but minor issues with …	Clearly defines scope of problem, stakeholders, and required goals. Summarizes and assesses credibility of information used.	… and includes information from authoritative sources to inform process, model, and conclusions.
Economic analysis: Describes economic feasibility of project using time value of money and defensible financial costs and returns	No useful economic analysis	Discusses economic principles in a broad or general way without relating to the actual project	Describes economic feasibility …but some unsupported or erroneous analysis	Describes economic feasibility of project using time value of money…	Describes a business plan considering value of money in decision making…
Ethical reasoning: Recognizes and resolves ethical dilemmas based on ethical principles and relevant code of ethics	Does not recognize an ethical dilemma, or …	Identifies approach to resolving an ethical dilemma that is not supported, or misses important stakeholders	Recognizes and resolves ethical dilemmas with limited reference …	Recognizes and resolves ethical dilemmas supported by ethical principles and relevant codes of ethics.	…and analyzes alternatives approaches to resolving a dilemma and how they will impact various stakeholders