Workshop 2A
What to look for in an Outcomes-Based Process

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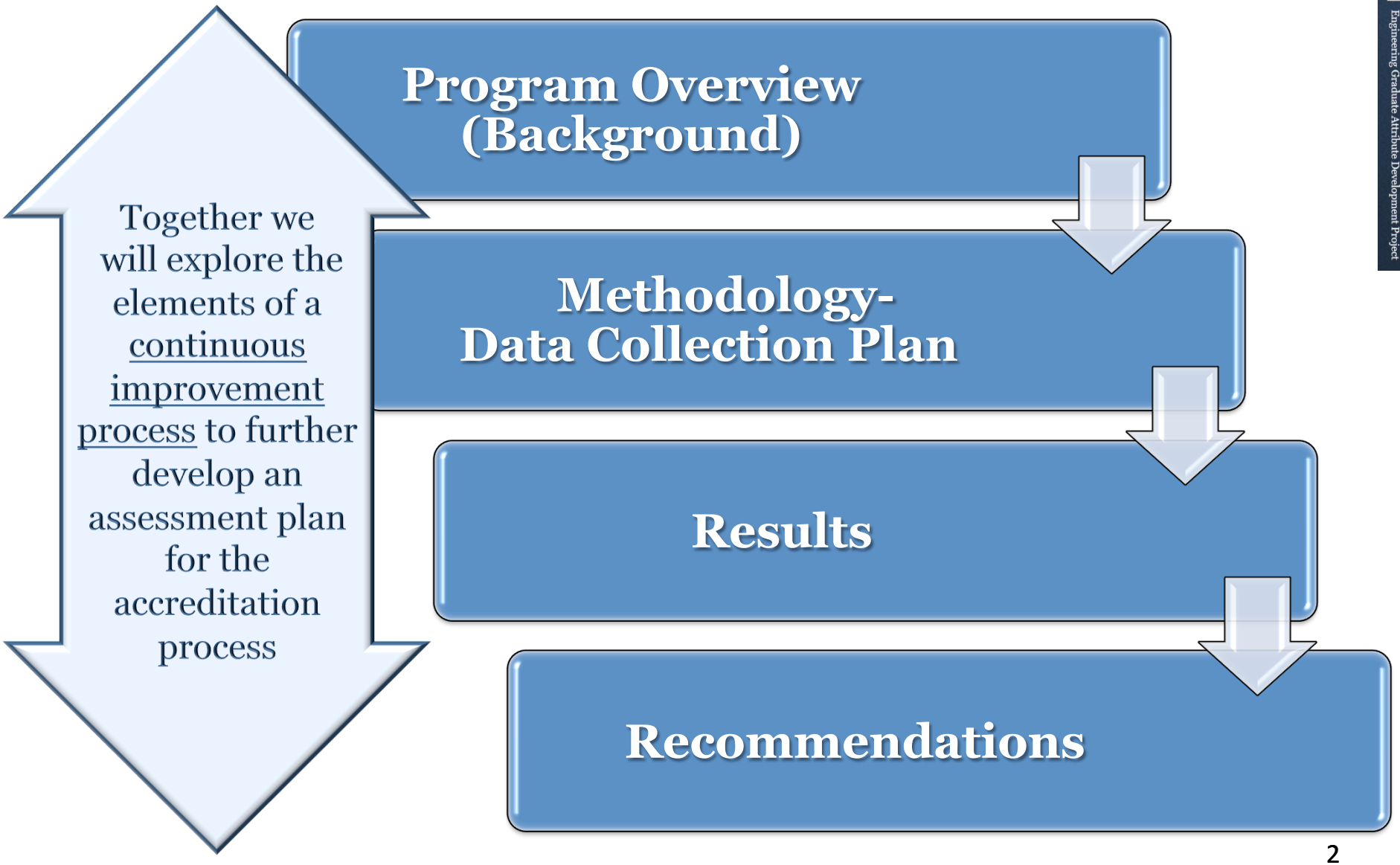
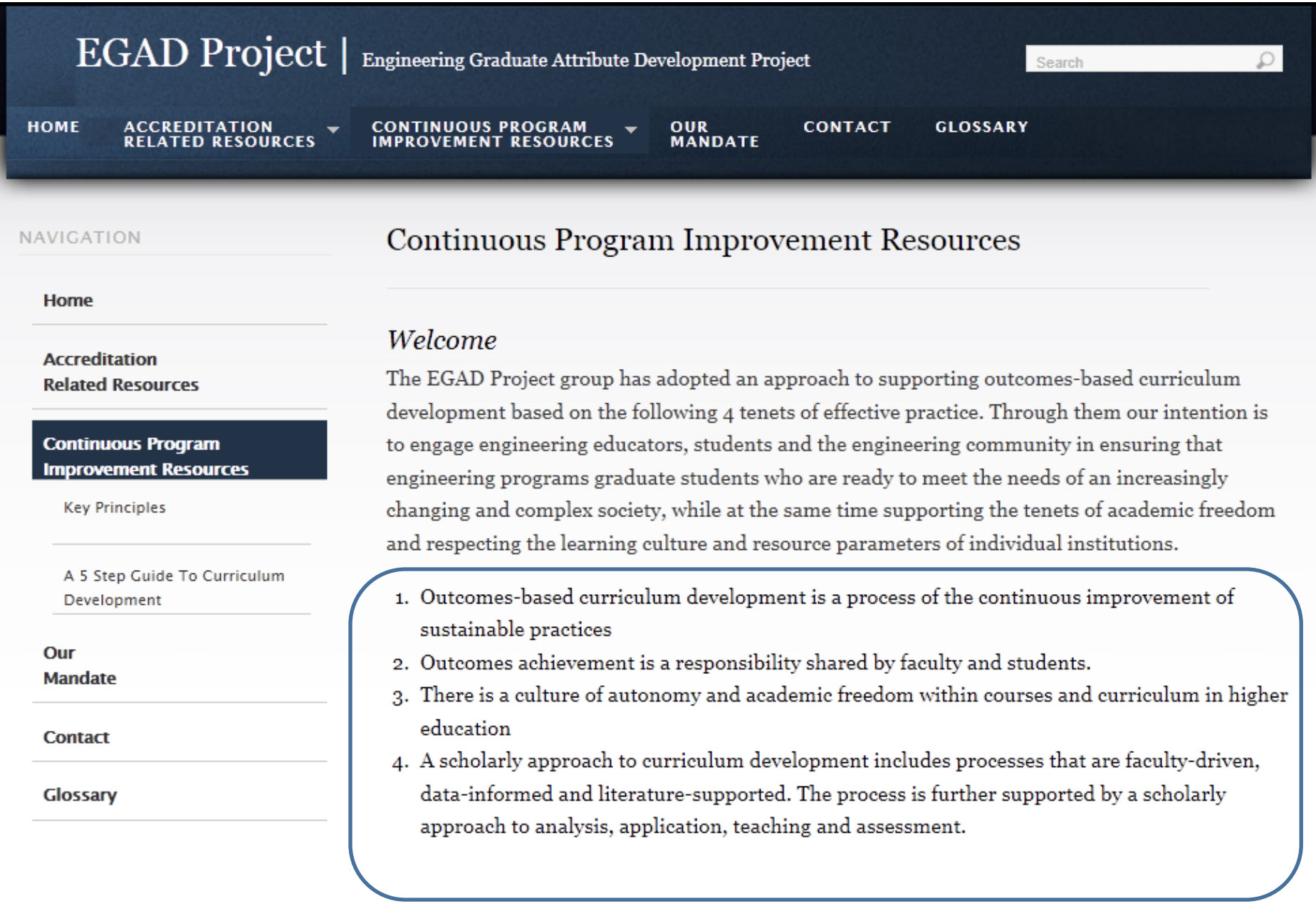
Agenda


Program Overview (Background)
Methodology- Data Collection Plan
Results
Recommendations
Together we will explore the elements of a continuous improvement process to further develop an assessment plan for the accreditation process



http://egad.engineering.queensu.ca/

1. Outcomes-based curriculum development is a process of the continuous improvement of sustainable practices
2. Outcomes achievement is a responsibility shared by faculty and students
3. There is a culture of autonomy and academic freedom within courses and curriculum in higher education
4. A scholarly approach to curriculum development includes processes that are faculty-driven, data-informed and literature-supported. The process is further supported by a scholarly approach to analysis, application, teaching and assessment.

Graduate Attributes Evaluation

- The program is assessed, not the students
- Continuous improvement process
- Not required to assess every student
- Not required to assess in every course
- Not required to assess every year

Goal: gather evidence on learning to
i) Benchmark program
ii) Improve curriculum

Continuous Improvement Process "Big Picture"

- Are students meeting expectations?
  - In what areas are they successful
  - What areas require improvement
- What data would help us improve our program?

- Example: Retention study

What to look for: Program Background

- Is the program clearly described?
  - Is there a curriculum map?
- Is the context of the program clear?

A curriculum map is like a process design on paper

It describes how the curriculum should work

An indicator is like a sensor: what indicators has the program chosen?

What to look for: Curriculum Mapping

- Information in a complete curriculum map is
  - Accurate, with some depth
  - Identifies intended outcomes from learning experiences
  - Not simply a list of topics “covered”
- Map provides information for each attribute
  - Can include curricular and other experiences

2013 CEAB reporting

Graduate Attribute	Semester						
	1	2	3	4	5	6	7
Knowledge base	CHEM101	PHYS102	MATH201	MATH202	MATH301	DSPE302	DSPE401
	MATH101	MATH102	MATH203	ENGR202	DSPE301	DSPE304	DSPE403
	ENGR101	ENGR102	ENGR201	NSCI202	DSPE303	DSPE306	DSPE405
	ENGR103	CMPT102	NSCI201	NSCI204	DSPE305		
			DSPE201	DSPE202			
			STAT201				
Problem analysis	ENGR103		DSPE201		DSPE303	DSPE302	DESX401
					DSPE305	DSPE306	DESX403

Graduate Attribute	Indicator	Relative Level		
		Inroductory	Intermediate	Advanced
Knowledge base	Creates mathematical descriptions for model real-world problems	MATH101		
	Selects and describes appropriate tools and methodologies to solve mathematical problems		MATH202	
	Recalls and describes fundamental concepts in chemistry	CHEM101	NSCI204	
	Recalls and describes fundamental concepts in physics	PHYS102	NSCI204	
	Recalls and describes fundamental engineering concepts	ENGR101		
	Comprehends and applies fundamental engineering concepts		ENGR202	
	Comprehends and applies discipline-specific engineering concepts		DSPE202	DSPE401
Problem analysis	Identifies known and unknown information, uncertainties and biases	ENGR103	DSPE201	DSPE302
	Creates process for solving problem including approximations and assumptions	ENGR103	DSPE201	DESX401
	Selects and applies appropriate quantitative model and analysis to solve problem	ENGR103	DSPE302	DESX401
	Evaluates validity of results, risks, errors and uncertainties	ENGR103	DSPE302	DESX401

Current CEAB Documentation: IDA

- Introduce - Develop - Apply/use

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.	1 L

** Enter content code most appropriate for each attribute

Content level codes: N/A = not applicable; I = introduced; D = developed; A = applied; ID = introduced & developed; IA = introduced & applied; DA = developed & applied; IDA = introduced, developed & applied

What to look for:

Curriculum Mapping

CEAB asks:

- Does the curriculum map matches course info sheets?
- Learning activities that only touch on one or few attributes?
- Grad attribute dependent on only a few learning activities?
- Assessment distributed over time?
- Assessment distributed over grad attributes?
- Too much dependence on any one activity?
- Better places to measure that aren't being used?
- Too many assessment points? Or too few?

Indicators

What to look for:

- Indicators align with attributes
- Indicators are “leading indicators”:
  central to attribute; indicate competency
- Enough indicators defined to identify strength areas and weak areas within an attribute
- Not too many indicators – resulting in reams of data but little deep information
- Indicators are clearly articulated and measurable

What to look for:

Indicators

CEAB asks:

- Are the indicators measurable
- Are the indicators aligned with the attribute?
- Are there enough or too many?

and again on assessment:

- Are the assessment points well chosen?
- Sufficient number and distribution?

Discussion: Indicators

1) For Attribute #3 (Investigation), which of the following potential indicators are appropriate?

   a) Complete a minimum of three physical experiments in each year of study.

   b) Be able to develop an experiment to classify material behaviour as brittle, plastic, or elastic.

   c) Be able to design investigations involving information and data gathering, analysis, and/or experimentation

   d) Learn the safe use of laboratory equipment

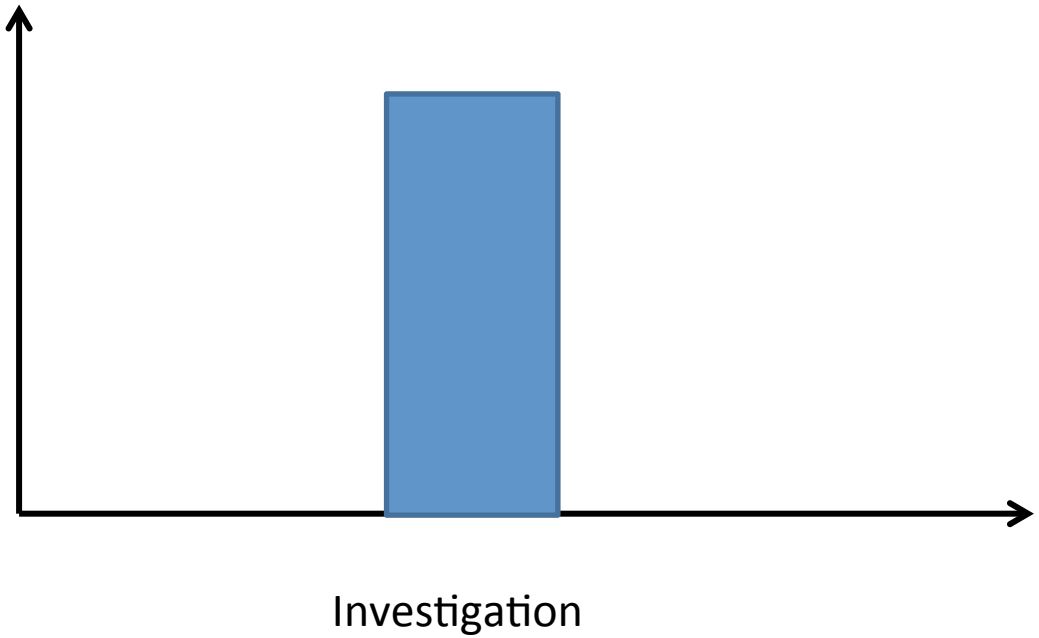
   e) Understand how to investigate a complex problem

Investigation: An ability to conduct investigations of complex problems by methods that include appropriate experiments, analysis and interpretation of data, and synthesis of information in order to reach valid conclusions

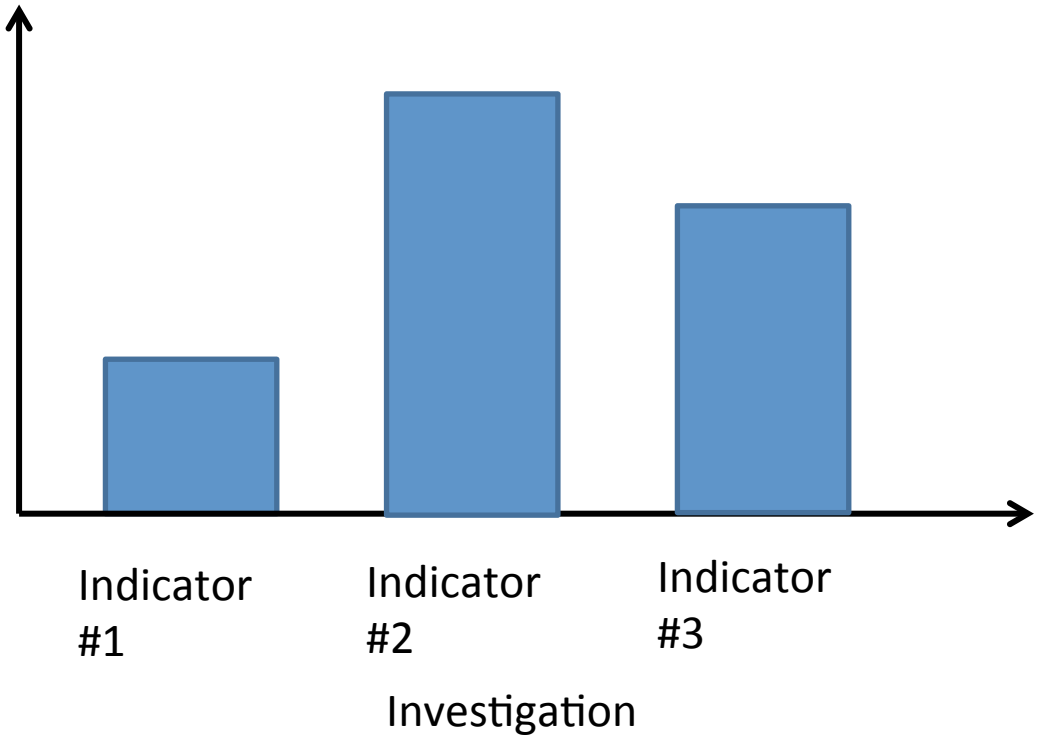
Indicators

Examples from UofT report
(cue example: UofT global outcomes, indicators

How many indicators is enough?



How many indicators is enough?



How many indicators is enough?

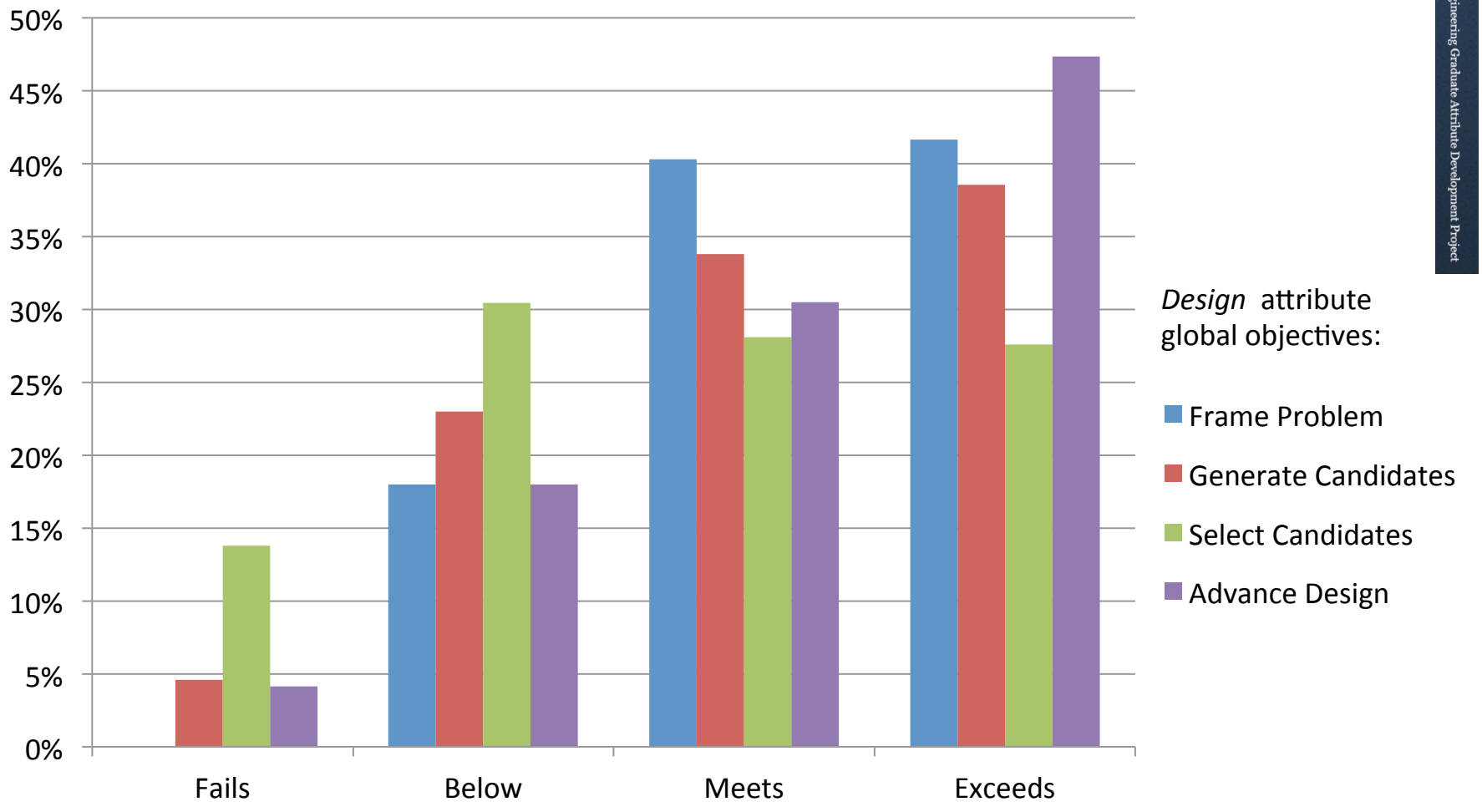
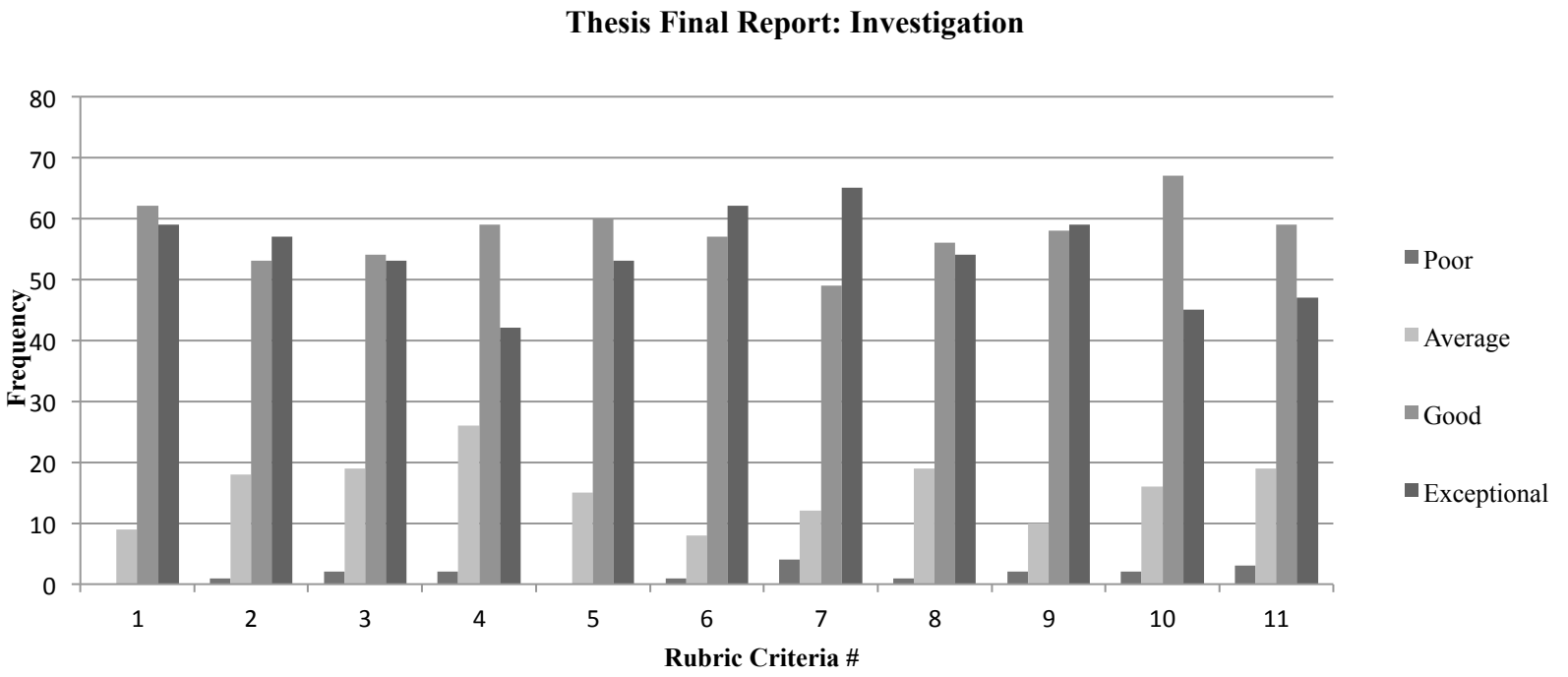


Figure 10: Percentage by category for *Design* attribute global objectives
(taken from UofT 1st year report, 2012)

How many indicators is enough?



1.Establishes context necessary to facilitate thorough understanding of thesis work in a concise manner.
2.Explains theoretical concepts important to understanding of thesis work.
3.Identifies, summarizes and synthesizes relevant research in constructing an understanding of current state of field.
4.Enables deeper understanding of research question/design problem through analysis of research in the field, indicating a path for moving research forward.
5.Establishes a clear research gap/design problem, makes a convincing case for the significance of proposed research work.
6.Identifies goal for thesis work that explicitly addresses this gap/problem; provides clear purpose statement.
7.Describes methods or design in sufficient detail to enable understanding of work done.
8.Provides justification for methods chosen or design decisions made.
9.Results displayed clearly in organized manner, using appropriate figures or graphics; key results highlighted.
10.Engages with and explains results intelligently.
11.Identifies key claims to be drawn from results of research or design evaluation, qualifies them appropriately.
(UofT Eng. Sci. report, 2012)

Methodology: Data Collection Plan

- On what does the program propose collecting data (i.e. indicators)?
- What methods are proposed for collecting data?
- Is the data collection plan good?

An indicator is like a sensor: what indicators has the program chosen?

Where have they placed their indicators? Where are the data collection points?

Does the proposed data collection plan make sense?

Terminology for data collection

Direct measures

- directly observable or measurable assessments of student learning

Indirect measures

- opinion or self-reports of student learning or educational experiences

Valid

- 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

What to look for: Overall

- Integrity:
  - Quality of the data collection plan
    - Indicators
    - Assessment points chosen
  - Valid, reliable data collection proposed
  - Plan is cyclic, continuous
- Results will be useful for informing curriculum change

Selecting Assessment Points

- Learning is generally demonstrated through:
  - Artifacts, e.g. written test, report, built project
  - Performances, e.g. oral presentation, observed practice
- What to look for:

Indicators are well aligned to the proposed assessment points

Enough assessment points are utilized

Expectations of performance quality are clear, i.e. the scale is defined

Why not JUST use grades?

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

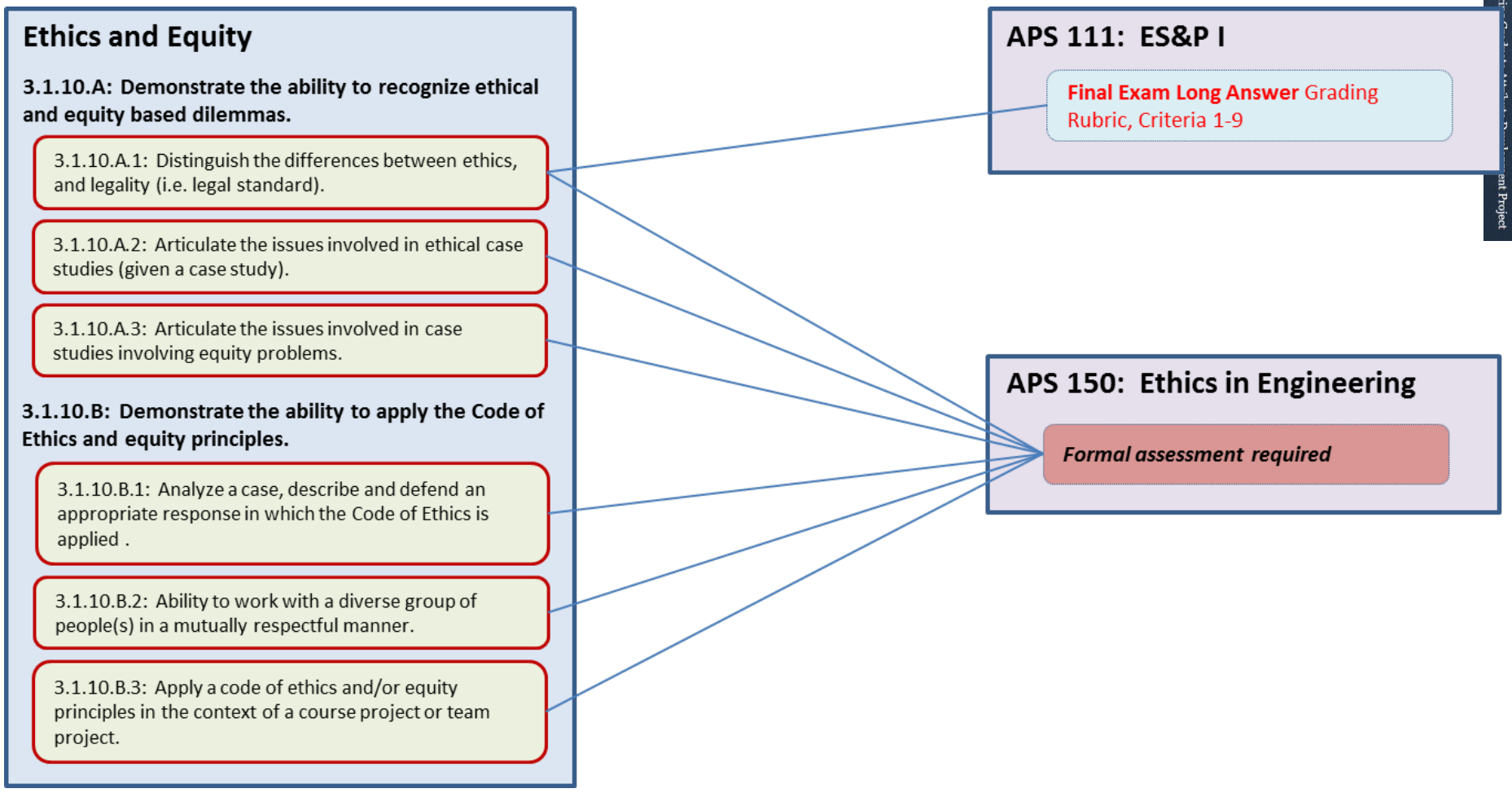
How well does the program prepare students to solve open-ended problems?

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 (plug-and-chug vs. evaluate)?

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



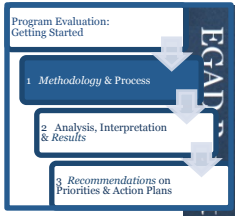
(cue other examples from 1st year report)

Triangulation

1. Include opportunities for informal assessment, students' self-reports of learning, and even unsolicited data from placement supervisors or employers
2. Use more than one type of assessment when analyzing data
3. Value all assessment not just major events
4. Use the data gained from assessment to answer questions about authentic learning
5. Look at data across time intervals

Improves reliability and data value

Rubrics: Provide a scale/benchmark



Dimensions (Indicator)	**Scale (Level of Mastery)**			
	Not demonstrated	Marginal	Meets expectations	Exceeds expectations
Indicator 1	Descriptor 1a	Descriptor 1b	Descriptor 1c	Descriptor 1d
Indicator 2	Descriptor 2a	Descriptor 2b	Descriptor 2c	Descriptor 2d
Indicator 3	Descriptor 3a	Descriptor 3b	Descriptor 3c	Descriptor 3d

Reduces variations between graders (increase reliability)

Describes clear expectations for both instructor and students (increase validity)

Current CEAB documentation

Provide examples of the assessment tools (rubric or other) used to comparatively evaluate performance for any 12 indicators listed in Table 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.

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 expectati
Investigation	*Indicator:*	*Performance descriptor*	*Performance descriptor*	*Performance descriptor*	*Performa descript*

Rubric example
(cue rubric examples: PR/PMP 2011, FDS2012)

Assessment Plan

- Continuous
- Sustainable
- Collects usable data → information
- Used to improve curriculum
  not fulfill a data volume requirement

What to look for:
Results

- Is the data clearly presented? Did the program follow through the data collection plan?
- On which Graduate Attributes is programming focused?
- Where are the focus attributes being best supported?
- Which Graduate Attributes are reported as getting the least attention?
- Where are the strengths: where are students meeting or exceeding expectations?
- What gaps exist in the program? Where are the weaknesses in student learning?
- Where in the program is student development being best supported? And where is there need for better support?
- Timing of data collection & analysis

Results

CEAB asks:

- Are the results reasonable?
- Are there too many people failing?
- Are there too few people failing?
- Is the threshold between success and failure reasonable and objective?
- Is the time-progression of the results reasonable?

Recommendations

- What do you look for in the Recommendations?
  - Analysis of the data is clear and well grounded
  - Results are used to inform curriculum changes
  - Loop is closed:
    - plan in place to implement recommendations
    - plan in place to measure efficacy of changes

CEAB documentation asks:

- Discuss the specific results with respect to future program expectations. What conclusions do you draw from the specific data presented?
- Who are the stakeholders consulted (or to be consulted) in the program revision process? How will the consultations take place?
- How are the results from data collection and analysis being used (or are planned to be used) in support of program improvement?
- What specific actions have been planned or implemented as a result of the data collection and analysis with respect to expectations for and achievement of graduate attributes?

Discussion