



The Handbook on

Large Classroom Engagement

2014

McMaster Engineering
Faculty Development Academy



This Handbook on Large Classroom Engagement was developed by Adam Sirutis and Minha R. Ha, as part of the Faculty Development Workshop Series led by Maria Massi. Permission has been obtained where resources from ISW Network have been adapted. The Faculty Development Academy at the Faculty of Engineering wishes to thank the input of faculty members who provided feedback and comments on this document, as well as those who provided facilitation support for related workshops. .



McMaster Engineering Faculty Development Academy, 2014

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Dean's Message

Experiential learning is an integral part of the innovative culture within the Faculty of Engineering. It has been made possible through myriad teacher-learner, teacher-teacher and learner-learner collaborations.

Our Invest for Excellence consensus urges us to construct new and effective learning experiences, which we must conceive for – and also with – our students. We are committed to enhancing a learning environment that is engaging for our students and providing the best possible teaching experiences for our faculty members.

As faculty members, you make so many contributions to enhance teaching and learning. Your hard work, dedication and accomplishments add to the success of our students and the impact that our Faculty has on our world.

Our students' learning improves as you become better prepared and stay more current with evolving technological advances in teaching. Therefore, please know that I thank each of you personally for taking the time to participate in this professional development workshop.

Ishwar Puri

Dean of Engineering, McMaster University

Overview of the Workshop

Objectives:

- Design and deliver lesson (or course) plans including individual, peer, apprentice learning strategies
- Give and receive constructive feedback on teaching
- Employ large classroom assessment techniques for pre- and post-assessment
- Design assessment to gauge students' actual learning (students already give feedback informally), link value to practice, etc.
- Would like active participation from students, and want to learn how to enable such engagement

Format:

This is an interactive workshop involving individual work, peer discussions, presentations, mini-lessons, feedback and reflections. The faculty facilitators will lead the large group discussions, be available for answering questions throughout the workshop, and manage the mini-lesson/feedback cycles in breakout sessions (groups of 3-5).

Part 1 – Engagement & Scholarly Teaching

Introduction, Goal-Setting & Expectations – What is Scholarly Teaching?
Thinking about 'engagement' and 'large class'
Planning Engagement

Part 2 – BOPPPS & Intended Learning Outcomes

Examination of BOPPPS model
Writing ILOs
Classroom Techniques: pre-test, active learning, post-test, , prepare peer-teaching

Part 3 – Peer Teaching & Classroom Techniques

Peer teaching, presenting to larger group for 5 minutes each, 3 groups
Preparing for mini-lesson
Review of personal goals, write any questions, continue mini-lesson prep

Part 4 – Mini-lessons & Peer Feedback

Briefing on the process
Mini-lesson #1 & feedback
Mini-lesson #2 & feedback
Mini-lesson #3 & feedback

Part 5 – Discussions & Reflection

Grading in large class courses
Managing maladaptive behaviour in class
Revisit goals and going forward

Preparing for the Workshop

I. Questionnaire

a. What are my biggest concerns in teaching large classes?

b. What does student engagement (particularly in classroom setting) mean to me?

c. What do I do well, and not so well, in my teaching?

e.g. Getting students working on tasks to perform and receive feedback in class; asking questions for students to think more critically; lowering anxiety for students to make mistakes or take risks in class

d. What are my goals for the workshop on large classroom engagement?

II. Mini-Lesson Topic

To participate in this workshop, you will need to prepare a short lesson to deliver during workshop and receive peer feedback.

The topic of your lesson need not to be complex, and it is not required to be relevant to the course(s) you teach. It should be simple enough to be explained in approximately five minutes. e.g. 'Making the perfect coffee,' or 'learning how to ride a horse.'

a. Topic of my mini-lesson (10 min in length):

b. What will my students (participants) learn from my lesson?

c. My personal goal in development as an instructor (e.g. Improving particular teaching skill, improving classroom engagement techniques, finding effective ways of gauging learner response):

d. What instructional materials could help my students learn most effectively?

Please refer to lesson plan templates on pages 12-15 to design your mini-lesson. You may work on your initial design further as the workshop progresses.

Part 1: Student Engagement in Learning

Theories of engagement and learning can help define what is meant by engagement in a teaching environment. Generally conceptualised as a purposeful process that results in, or contributes towards, the attainment of educational objectives, the following present three particular ways of understanding engagement:

- “Willingness, need, desire and compulsion to participate in, and be successful in, the learning process promoting higher level thinking for enduring understanding” (Bornia et al., 1997: 294).
- Behavioural and emotional processes in learning (Skinner et al., 2008).
- Making a psychological investment in learning, internally driven to understand the material and incorporate or internalise it in their lives (Wankat & Oreovicz, 1993).

The first notable characteristic of engagement is students making an active connection to the learning activities and material. There is an internal drive (motivation) towards achieving intended results (learning); a level of appreciation or enjoyment of the process itself is also noted above. Cognitive processes characterise how students make sense of and internalise content and experiences to enduring learning that is effective.

How such processes can be made observable and, reversely, stimulated or facilitated, constitute an important part of teaching endeavour. An instructor’s response to student behaviour is inherently subjective, and s/he can inadvertently encourage and validate certain forms of engagement while discouraging others. It is also important to note that certain forms of engagement do not necessarily equal learning, but different forms of engagement may be important for a student to learn to the best of their abilities. For example, a student may be actively making conceptual integration of spoken concepts while another student is gaining insights by being challenged to articulate his/her own ideas. Thus developing strategies to recognise and promote deeper learning promises to be a rewarding effort.

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What does student engagement mean to you?

- Purpose of engagement in education
- Observable signs of engagement, both spontaneous and structured
- Motivational factors to engagement in learning
- Factors hindering or discouraging engagement in learning

Experiential Dimensions

A wide array of experiential learning takes place in the Faculty of Engineering, both in and out of classroom or lab settings. In order to understand what constitutes, and how instructors may facilitate, experiential learning, it is important to clarify how we conceptualise a ‘learning’ and ‘experience.’ Beard’s (2010) six dimensions of learning experience provides a good starting place for discussion:

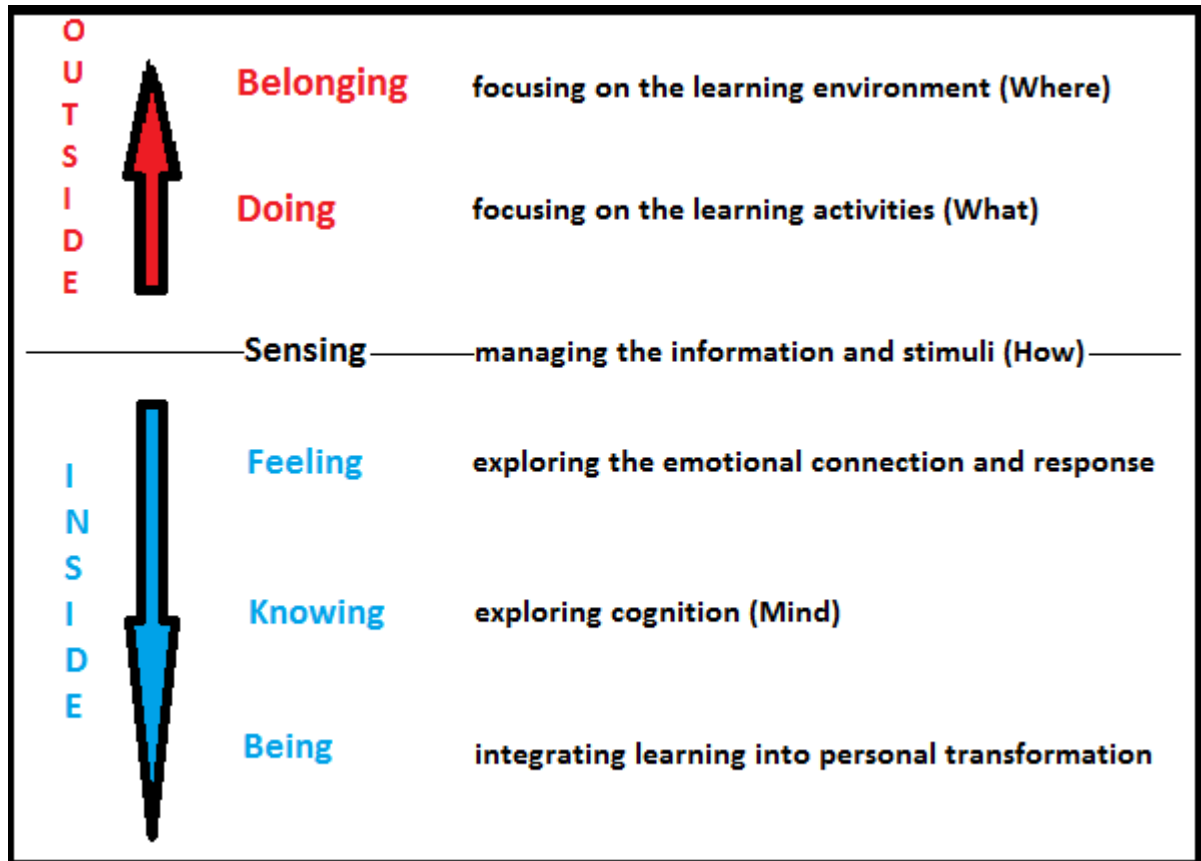


Figure 1: Experiential Learning Diagram¹

Belonging and Doing are in the *external environment* of the learner. Some of the observable features and can be directly shaped by the instructor. Feeling, Knowing and Being consist of the *internal environment* of the learner. Sensing is thought of as the *interface* between the outside and the inside.²

Learning is considered an inherent process of change. As learning progresses, it is expected that deep learning is associated with an integrative change in the ways a learner identifies him/herself in relation to the learning material (or field of discipline), expressed in qualities or attributes of becoming e.g. an expert, a professional, and/or a leader.

¹ This is a working diagram by Adam Sirutis based on Beard’s (2010) work, May 17, 2014.

² Beard, Colin M., (2010). The Experiential Learning Toolkit, Kogan Page Limited, London

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Instructors can do many things in the **planning** process that affect the learning experience of students. These include, but are not limited to: Setting up the learning environment, structuring the classroom activities, developing feedback mechanisms, and establishing communication channels and content. The following questions can be considered to inform instructional decisions before classes, as well as allow deliberate adaptation to the interactions taking place during class.

1. Belonging *focusing on the learning environment (where)*

How can the physical space be managed for ideal learning?

What kind of e.g. social environment, sense of belonging, connection to the instructor, are being made?

2. Doing *focusing on the learning activities (what)*

What will the learners actually do?

How will you structure the activities?

3. Sensing *managing the information and stimuli (how)*

Where will the students' attention be drawn to (what will learners be focusing on), and how?

How do learners receive and perceive information?

How does the structured learning activity connect with the thought processes, attitudes, and decisions of the learners?

4. Feeling *exploring the emotional connection and response*

What is the nature of the emotional engagement?

What are the expected forms of emotional responses to the learning activities?

If there are constraints to learning, are they identifiable by emotional dynamics?

What motivates learning?

How can emotional connections to content or activity enhance learning?

5. Knowing *exploring cognition (mind)*

What is the expected process/stages in the learners' cognitive development in your particular topic, outcome?

6. Being *integrating learning into personal transformation*

How can learners become/be the professional engineers we expect?

When does learning become personal and transformative?

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Use the space below to identify how you are currently shaping these 6 dimensions. Write down ideas that may help diversify and enhance the learning experiences inside the classroom:

Belonging	
Doing	
Sensing	
Feeling	
Knowing	
Being	

Experiential Learning Process

Students are active agents of constructing knowledge and integrating learning, as much as instructors are active resource providers, influencers and facilitators of the learning activities. Kolb's theory of experiential learning has been useful for understanding how students activate the learning potential of an experience, which involves a cycle of four stages (Figure 2): (1) Having a concrete experience (or a series of experiences), followed by (2) an observation of, and reflection on, selected parts of such experience. Key questions are answered, and patterns made sense of, by the (3) the formation of abstract concepts and conceptual relationships, which are then (4) applied to a practical task, or tested in a new situation, effectively resulting in new experiences.⁵ This type of learning acknowledges the potential to change the way a learner performs, reacts, behaves, achieves results in particular situations, as well as the potential for the learner to translate the developed knowledge, skills, and attitudes (dispositions, values) to apply in a different type of setting as well.

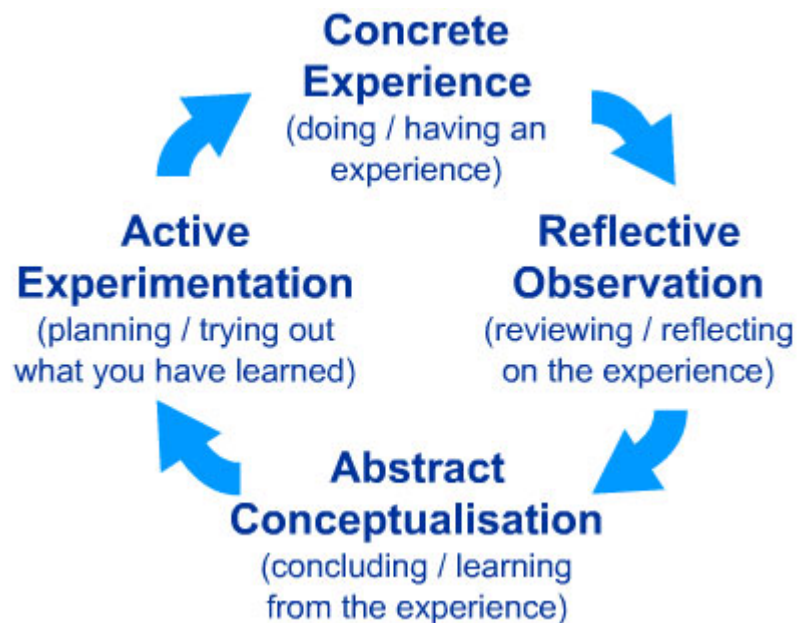


Figure 2: Kolb Learning Cycle³

³ McLeod, S. A. (2010). Kolb - Learning Styles. Retrieved from <http://www.simplypsychology.org/learning-kolb.html>

Roles in Learning Activities

As Gentry (1990) articulates, conceptualisation of learning process effectively assumes conceptualisations of the learners as well:

“Experiential learning exists when a personally responsible participant cognitively, affectively, and behaviourally processes knowledge, skills, and/or attitudes in a learning situation characterized by a high level of active involvement.”⁴

Active participation in learning activities implies ownership, independent thought, interactional exchanges with other participants, and achievement of deliverables. Instructors can distribute and diversify the types and levels of responsibility between instructor and students, concerning the activities taking place inside the class and at the course level.

An important consideration is that certain objectives or materials of a course are a better fit for individual learning by the student, and others are a better fit through senior student mentorship, or direct expert communication to the student. The Tom Angelo Pyramid categorises learning activities into four types: individual learning, peer learning, cross-level learning (with more senior students), and interaction with expert (e.g. instructor, supervisor, industry mentor):

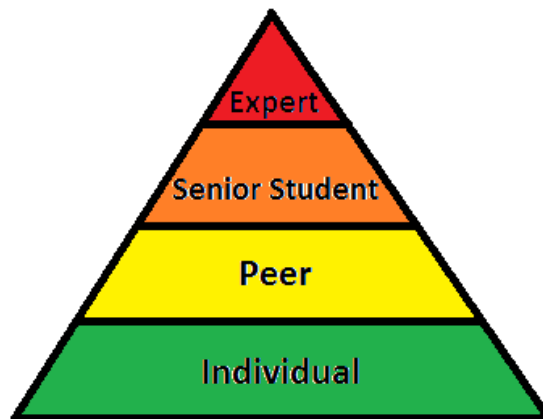


Figure 3: Tom Angelo Pyramid on roles in student learning⁵

If an activity is best utilised by individuals or peers directing the process, the instructor can take on a role much like a guide. If an activity requires the instructor to act as the expert, the students can take on an active investigator role, which will require orientation or training. The instructor can design for a variety of learning activities within a class, and facilitate the transitions between roles.

⁴ Gentry, James W. (1990). What is Experiential Learning?, Guide to Business Gaming and Experiential Learning

⁵ Tentatively named figure, reproduced based on an illustration presented by Angelo, T.A., (2014) at Teaching and Learning Innovation Conference, University of Guelph, 31 April - 1 May. Permission was given orally at the conference to utilise and adapt his materials.

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Exercise: For each stage of the experiential learning cycle, discuss and write what the best and most appropriate role of students would be. Then write down ideas on what role the instructor could take on, to best support student achievement in each stage.

	Student Role(s) and Tasks	Instructor Role(s) and Tasks
Concrete Experience		
Reflective Observation		
Abstract Conceptualisation		
Active Experimentation		

Part 2: Intended Learning Outcomes

An **Intended Learning Outcome (ILO)** describes what the student should be able to do or demonstrate, in terms of particular knowledge, skills and attitudes, by the end of the course.⁶

Example:

By the end of this course, you should be able to:

- Identify and explain major materials processing techniques in industry
- Demonstrate a good understanding of basic thermodynamic principles
- Apply these principles to solve relevant materials science problems

When creating an ILO, consider knowledge, understanding and skills you intend students to learn through to course. Ask yourself some of the following questions:

- What do I want students to know and be able to do by the end of this course?
- How will students be able to use this? In what context?
- What will students need to do in order to demonstrate that they have achieved these outcomes?
 - If someone were to ask a student what they have learned after they have completed this course, how would you like them to answer?

Examples of action verbs used in ILO's	
Prepare a professional report on the results of research and experiments	Compare the differences and similarities between electrophoretic and electrolytic deposition
Summarize the three laws of thermodynamics	Define Initial and boundary conditions
Illustrate and label the steps of the production of steel	Analyze data from independent lab work and experiment
Apply previously learned theoretical knowledge in a lab setting	Label the structure of DNA
Design an effective method to produce a bulk transparent conductive material	Discuss the importance of sustainable engineering in the modern world
Implement a method of testing the effectiveness of your design	Explain the effect of modern production techniques on the environment
Develop a water purification system	Evaluate the practicality of a certain circuit design

⁶ Mann, S.J., (2004). "Guidelines for Writing Aims and Intended Learning Outcomes at the Programme and Course level"

Taxonomies of Learning Outcomes

The taxonomies of learning outcomes are important because their purpose is to articulate the **observable** demonstration of intended learning outcomes, in terms of **action** performed by students, situated within **learning theories** that guide both the instructors and students on how they direct their efforts for learning. As each category is examined below, it is important to note that levels of taxonomy within each category do not suggest division of taxonomies by academic levels (e.g. 'Create' for final year students and 'Remember' for first year). As observed in the Faculty of Engineering, each academic year involves all levels of taxonomy; 'Remembering' task of complex content in final year is much more difficult than 'Create' task of simplified exercises in first year.

Cognitive

The cognitive taxonomy shows the path which learners develop from simply remembering factual knowledge to being able to create new knowledge and reflect on their learning. Traditional education tends to emphasize skills in the lower-order thinking domain. Modern educational theories tend to place a premium on the higher-order thinking domain. It is important to note that the higher-order thinking objectives cannot be obtained with mastery of the lower-order objectives.

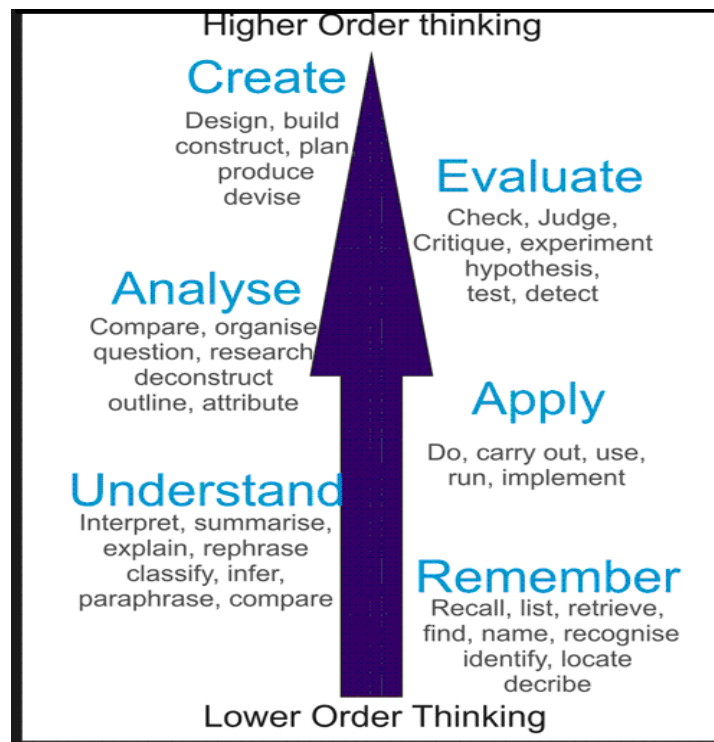


Figure 4: Bloom's Cognitive Model⁷

1. Knowledge: Retrieve relevant knowledge from long-term memory.
Ex. Recall the names of important people in psychology

⁷ Churches, A. (2007). Bloom's Revised Taxonomy

2. Comprehension: Construct meaning from instructional messages, including oral, written and graphic communication.
Ex. Explain the causes of important eighteenth-century events in France
3. Application: Carry out or use a procedure in a given situation.
Ex. Use Newton's second law in appropriate situations
4. Analysis: Break material into its constituent parts and determine how the parts relate to one another and to an overall structure or purpose.
Ex. Distinguishing between relevant and irrelevant information given in a mathematical word problem
5. Evaluation: Make judgements based on criteria and standards.
Ex. Determine whether a scientist's conclusions follow from observed data
6. Creation: Put elements together to form a coherent, functional whole; reorganize elements into a new pattern or structure.
Ex. Generate hypothesis to account for an observed phenomenon

Affective

The affective taxonomy covers development from being open to new experiences through to the internalization of a personal value system. Emotion is directly linked to memory, which is why we can recall many details from a deeply emotional experience. High-level affective traits are necessary for students to be able to participate in critical-thinking discussions.

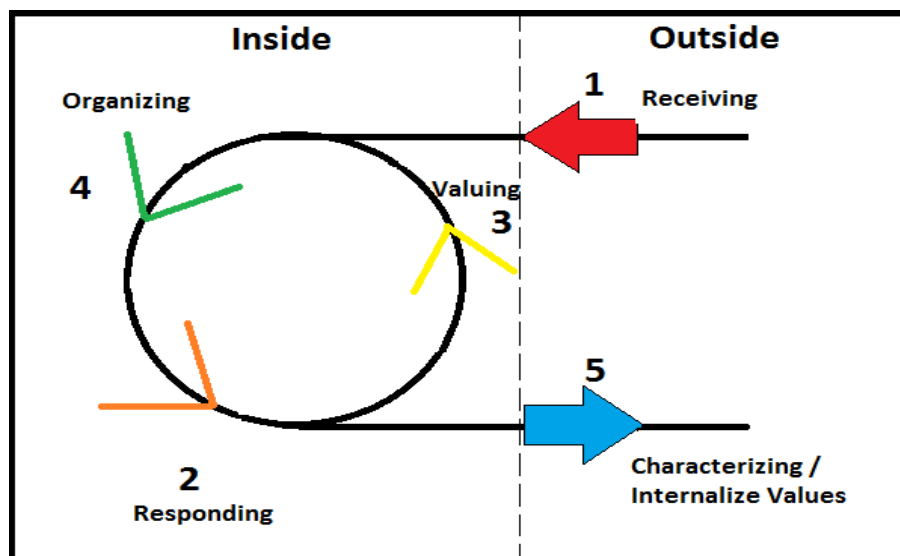


Figure 5: Affective Taxonomy Model⁸

The first level of the affective taxonomy, Receiving, happens “outside” of the student’s mind. It is the willingness to take in the information given. The instructor can have influence on this level by the influence they have on the student’s motivation. The next three occur “inside” the student, as they reflect, value and organize the information according to their morals, ethics and values.

⁸ This is a working diagram by Adam Sirutis, June 5, 2014.

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The fifth level, Characterizing / Internalize Values, cause the student to go through a change and exhibit a visible behaviour influenced by what was learnt.

1. Receiving: Open to experience; willing to hear
Ex. Listen to instructor, take interest in class, participate passively
2. Responding: React and participate actively
Ex. Participate actively in group, probe ideas, suggest interpretation
3. Valuing: Attach values and express personal opinions
Ex. Argue, challenge, debate, refute, persuade
4. Organizing: Reconcile internal conflicts; develop value system
Ex. Qualify and quantify personal views, state personal position and reasons
5. Characterizing / Internalize Values: Adopt belief system and philosophy. Visible behavioural change.
Ex. Self-reliant, behave consistently with personal values

Psychomotor

The psychomotor taxonomy is linked directly to physical ability, but it can be applied to business and social skills as well. These developmental steps relate directly to adaptation to new experiences that require combining activities to develop new methods. The psychomotor taxonomy most significantly relates to engineering in a lab setting; using and manipulating tools and equipment.

1. Guided Response: Copy action of another; observe and replicate
Ex. Instructor demonstrates how to use a pipette. Student then replicates the action
2. Mechanism: Reproduce activity from instruction or memory
Ex. Student creates a certain acid solution from written instructions. Student may receive feedback on performance
3. Complex Overt Response: Execute skill reliably, independent of help
Ex. Student performs and correctly measures the HV Hardness of their steel sample without instruction
4. Adaptation: Adapt and integrate to satisfy a new objective
Ex. Student responsibly uses equipment for its non-original purpose. e.g. a test tube as a rolling pin
5. Origination: Automated action at a high level
Ex. Given a goal, student can act independently in the lab. Knows which equipment to use for what purpose

Fink's Taxonomy of Significant Learning

Engineering education is particularly rich in the use of project-/team-based methods that address open-ended problems. Considered fitting for the new learning paradigm that undergirds such methods, Apul and Philpott (2011) adapted Fink's (2003) taxonomy of significant learning for their practice in sustainability engineering education. The taxonomy includes the following:

1. Foundational Knowledge: Understanding and remembering information and ideas
2. Application: Developing and performing skills, including thinking (critical, creative, practical) and management (projects)
3. Integration: Forming connections between ideas, people, and realms of life
4. Human Dimension: Learning about oneself and others
5. Caring: Developing new feelings, interests, and values
6. Learning How to Learn: Becoming a better student, self-directing learners, effective inquirers about a subject

Types of Learning

An alternative way of categorising types of learning to cognitive-affective-psychomotor developments is Tom Angelo's (2014) model of learning levels. Each level builds on, and reinforces, the level below. This serves as a tool to review the types of tasks within a course; the instructors are encouraged to develop their own learning taxonomies as appropriate to each type.

- **REFLECTIVE LEARNING (highest level)**: Learning Why – self-knowledge, cultural awareness, ethics, etc.
- **METACOGNITIVE LEARNING**: Learning How to Learn – directing and managing one's own learning
- **CONDITIONAL LEARNING**: Learning When and Where – applications
- **PROCEDURAL LEARNING**: Learning How – skills and procedures
- **CONCEPTUAL LEARNING**: Learning What – concepts and theories
- **FACTUAL LEARNING (lowest level)**: Learning What – facts and principles

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On the lines below, list three of four learning outcomes for your class

When you have completed this course, you should be able to:	Rank in order of importance:	Score level of complexity:
_____		(/5)
_____		(/5)
_____		(/5)
_____		(/5)

Given your top level intended learning outcome statement, it's important to communicate to the students what is expected in their performance. Use the following questions to define the criteria for judging the quality of student performance:

1. Refer to/ Recall one example of superb performance, and one example of poor performance. What did the former have that the latter could not? What question could you ask, where you can answer 'yes' on the superb example, and 'no' on the poor example.
2. Are these included and explicit in your course or assignment rubric? Are there ways to aim for these criteria in classroom activities?

Part 3: Learning & Engagement Techniques

Short Activities^{9 10}

The following teaching techniques are useful for getting a measure of the students' understanding of the content as well as promoting participatory learning. These can be used in class, meant to be quick (5-10 min), for either pre- and post-tests, and/or participatory learning.

Brainstorming

Brainstorming is a technique to list as many answers to a question or solutions to a problem as possible. This is an effective technique for:

- Actively involving the total group
- Solving difficult problems
- Tapping knowledge and experience of the group

Instructors Role:

- Introduce a problem or issue facing the group
- Appoint a recording secretary
- Present ground rules (all ideas are valid and accepted)
- Start suggestions off (if necessary)
- Avoid evaluating individual comments
- Establish a time limit
- Assist group to broaden scope of responses
- Decide system of evaluation of suggested responses

Learner's Role:

- Think creatively
- Present all ideas
- Refrain from initially expressing opinion on other members' solutions
- Assist in evaluating the solutions when the brainstorming session is over
- Determining best use of information

Directed Paraphrasing

Ask students to summarize, in no more than three concise sentences, what they have learned about the topic in order that they could explain it to an interested friend. By verbalizing their thoughts, this activity helps students to remember key terms, and makes sure that they

⁹ For more information, please refer to Angelo, T.A. & Cross, K.P., (1993). Classroom Assessment Techniques: A Handbook for College Teachers, 2nd edition. San Francisco: Jossey-Bass, pp. 290-294.

¹⁰ Drawn from ISW Network's (2006) Instructional Skills Workshop Handbook.

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understand the concepts. This tool also gives the student the opportunity to be corrected on anything they have misunderstood.

I-clicker

The I-clicker enables the professor to poll the students with a question. This technique improves student engagement and provides opportunities for real-time assessment. The instructor can identify and discuss common **misconceptions** and mistakes, and students can find out whether or not they truly understand the topic.

A good technique with the I-clicker is to introduce and teach a new topic, and then have students try and solve a problem individually and answer with the I-clicker. If there isn't a large majority for the correct answer, have the students discuss the problem with their peers for a few minutes. Have the students answer again with the I-clicker. Hopefully, there will be a shift of votes towards the correct answer.

One-Minute Paper

This can be used to ask students if they understand, and check their knowledge. Mid-way through the lesson or at the end of class, pose one or two questions to the students. For example, "What was the most important thing you learned during this class" or "What important question remains unanswered?". Have the students write their answers on an index card or half sheet of paper and hand them in while leaving class. About five minutes should be given for this exercise. You can then review their responses before the next session.

Rating 1-5 Scale

This technique is ideally used as both a pre and post-test. This will not directly assess the students understanding of the material, but instead will gauge their **confidence** in their understanding of the material. Students will rate their knowledge on a scale from 1 to 5 after being posed a question. The question will not ask them to rate their confidence directly, but ask them to rate their knowledge of a certain concept. By implementing this technique twice in one class as the pre and post-test, you can observe the change in students' answers. If anonymous, fairly accurate results will be obtained, however, the student's actual understanding of the topic may vary in either direction from this result.

Example:

How would you rate your knowledge of the following?	1 (No understanding)	2	3	4	5 (I know this very well)
The differences between electron and neutron imaging techniques			X		
The drawbacks of the direct smelting of copper		X			

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This technique can be accomplished by using I-clicker, by asking students to raise their hand for a certain number, by handing in their answer on paper, or by asking students to come up to the blackboard and mark down their number. By using this technique as a pre-test and again as a post-test, it can be interesting to see the change in students' answers.¹⁶

Think/Pair/Share (TPS)

This is a simple activity that involves students working in pairs. The objective of TPS is to engage the class with the material on an individual level, in pairs, and finally by sharing to the large group. The activity can help to organize prior knowledge, brainstorm questions, or summarize, apply or integrate new information.

This strategy allows students to take a moment to think about, reflect on and work with material before moving to new information. It promotes the communication of ideas to others in a clear manner and can help the instructor gauge how well students understand the content.

The TPS procedure:

1. Give students a question that requires them to solve a problem
2. Ask individuals to plan out the method step-by-step to solving the problem
3. Instruct students to form groups of two or three to compare each other's methods.
4. Let them discuss and make any necessary changes
5. Now, have them work together to actually solve the problem
6. Invite everyone back together as a large group and ask for volunteers or randomly
7. Choose a few pairs to give a brief summary of their answers

¹⁶Borrego, M. (2007). Conceptual Hurdles Experienced by Engineering Faculty Becoming Engineering Education Researchers. *Journal of Engineering Education* 96 (1): 91-102

Long Activities¹²

The following teaching techniques can be used as one piece of the full lesson; some of them can encompass a full lesson itself. When used for participatory learning purposes, it is important to link the activity to some kind of observable outcome, in order to solidify learning and to give feedback on learning progress.

Case Study

A case study is a description of a real-life situation presented to the class participants who then analyze the aspects of the problem and offer a solution. Case studies may be analyzed by individuals or small groups.

Instructor's Role:

- Prepare the case study, recording information factually, considering the following aspects where relevant:
 - People involved
 - Historical background
 - Relationships among people
 - Sociological and economic factors
 - Tensions causing problem
- Assist group members in analyzing and solving the problem
- Summarize findings
- Suggest uses of the information

Learner's Role:

- Assist in preparing case study if requested
- Read and listen to case study analytically
- Determine the real or underlining issues
- Determine why the problem exists
- Determine what principles might assist in understanding the situation
- Suggest a solution
- Consider the best solution to the problem, giving an adequate reason for the choice

Demonstration and Practice

Demonstration and practice is useful for learning a task involving development of a skill. Ultimately, the learner should perform the learning task to a satisfactory standard on his or her own. A demonstration and practice session:

- Assists learners to master a motor skill
- Assists with transforming theory to application
- Should be followed by a period of questions and answers
- Is best in smaller groups

¹² Drawn from ISW Network's (2006) Instructional Skills Workshop Handbook.

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- Must have individual instruction during practice period allows a high group involvement

Instructor's Role:

- Prepare proper equipment for demonstration
- Must be confident of her or his own ability to perform the task
- Introduce the theory and purpose
- Describe the steps of the operation
- Proceed slowly
- Review procedures and answer questions
- Assist in practice

Learner's Role:

- Understand purpose of demonstration
- Listen actively and watch carefully
- Ask questions
- Suggest new ideas or alternative methods
- Practice steps of procedure
- Apply new knowledge

Field Trip

A field trip is a planned visit by a class that:

- Incorporates community resources unavailable in the classroom
- Provides visual education that offers first-hand experience with a place of interest or object, thus bringing realism to learning
- Provides a change of pace
- Is good for courses involved with community development
- Should be preceded by a brief introduction in class and followed by a period of discussion

Instructor's Role:

- Survey local community or region to locate points of significance to field of study
- Obtain approval of owner or host
- Detail arrangements in advance as to purpose, number of visitors, time of arrival and duration
- Arrange for transportation including means of covering costs
- Provide class with information on the objectives of the field trip
- Allow for discussion and questions after the field trip
- Summarize the experience
- Suggest further study

Learner's Role:

Prior to trip:

- Understand purpose and objective
- Listen to instructions given by leader

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- Obtain information about place to be visited

On the Field Trip:

- Obtain information from the guide
- Ask questions and request additional information as trip progresses
- Relate what is seen and heard to the objectives

After the trip:

- Analyze and interpret knowledge gained on the field trip, through group discussion

Focused Listening

Select a topic that the class has just studied and ask students to make a list of the important concepts of the topic. Have students review the list by themselves or with partners to make additions or deletions as needed. This is a short activity that ensures students remember and understand the key concepts from the lesson. This can be an especially useful tool to use mid-class when teaching difficult material.

For example, before starting a complex or difficult lesson or explanation instruct students to do the following:

- Have students write down a question they will be able to answer by the end of the lecture.
- Have students extract key concepts as they listen, and do a rough sketch of how they relate to the question.

After the lesson, make sure you have a few minutes to clarify these conceptual relationships. Following these steps will give students a conceptual map that they made themselves in their notes that they can refer back to on this complex subject.

Panel

In a panel, several people discuss an assigned topic with the group. The information is presented by these experts with an exchange between panel members, instructor and learners.

Instructor's Role:

- Select and invite experts
- Meet with panel to discuss procedures
- Inform class of advance reading and research required
- Organize setting, introduce panel; members and topic, moderate, summarize panel contributions, suggest follow-up activities

Learner's Role:

- Do advance reading and research as advised
- Associate new information with previous experiences
- Identify and integrate new ideas
- Apply new information through follow-up activities

Working Pairs and Work Stations

This is a way to layer degrees of peer interaction. A movable classroom may be ideal, but a standard lecture hall can work just as well. Students work in pairs (alternatively, the class may be divided into groups of 3-4) and either choose (movable classroom) or are assigned to (fixed classroom) a particular work station. Each work station addresses a specific aspect of a complex, but well-stated problem. Students generate responses (instructor must provide structured format or specific questions) in pairs, then discuss in multiple pairs in order to help each work station develop a collective response. Each work station may have one or multiple facilitators, as appropriate to the number of students involved. Having flip charts also helps record and focus student attention to the task.

The instructor and teaching assistants can visit work stations to help answer questions, provide suggestions, and stimulate discussions that pertain to the task at hand. There needs to be a clear time limit allotted to each step of the activity (pair discussion, consolidation of responses). Once the time limit has been reached, the facilitators of work stations present their collective responses on the wall, board, or by PPT. Instructor responds to the findings, leading the students to key lessons from the activity as related to course objectives.

Instructor's Role:

- Assist in determining the problem
- Divide class into groups
- Give instructions to groups
- Define task clearly
- Inform group members of time limit (usually 5-15 minutes)
- Suggest each group select a leader and a recorder
- “Float” around the class to provide assistance
- Call “time” for the groups to reassemble
- Summarize the findings of each group

Learner's Role:

- Assist in determining issue or problem
- Select a leader and recorder
- Restate and define issue or problem
- Give suggestions for discussing issue or for solving the problem
- Listen intently to other group members' contributions
- Build on the contributions of others
- Determine how this information is to be used and put into action
- Record summaries and report contributions to the whole group as requested

Part 4: Lesson Design

BOPPPS

BOPPPS model is a tool to help instructors organize their teaching sessions. To prepare for teaching, most educators develop lesson plans, which typically contain three components: an introduction to the topic, the body of the lecture, and concluding remarks. BOPPPS is a more in-depth and detailed version of this basic model. BOPPPS places an importance on gaining students' interest, making the purpose of the lesson known, assessing students' level of understanding of the topic, engaging students in active learning, determining whether the purpose has been met, and summarizing main points to reinforce what has been learned.¹³

- Bridge-In** Begins the learning cycle, gains learner attention, builds motivations, and explains why the lesson is important. RELEVANCE to learners' immediate circumstance or foreseeable future is key.
- Objectives** Clarifies and specifies the learning outcome: clarifies what the learner should know, think, value or do by the end of the lesson, under what conditions and how well. Use these to help students self-assess and monitor progress.
- Pre-Test** Answers the question, "What does the learner already know about the subject of the lesson?" It is an assessment that is used to collect information about students before a lesson or new unit of study. This is to determine the students' prior knowledge and readiness for the new subject.
- Participatory Learning** This is the body of the lesson, where learners are involved as actively in the learning process as possible. There is an intentional sequence of activities or learning events that will help the learner achieve the specified objective or desired outcome. The lesson may include the use of media.
- Post-Test** Formally or informally demonstrates if the learner has indeed learned and is linked directly with the objective or outcome. Were the desired objectives accomplished?
- Summary** Provides an opportunity for the learners to reflect briefly and integrate the learning during the closing of the learning cycle.

¹³ ISW,(2013). BOPPPS Model. Retrieved from http://hlwiki.slais.ubc.ca/index.php/BOPPPS_Model

Pre- and Post-Test

Plan the Pre-Test, in order to answer:

“What does the learner already know about the subject of the lesson?”

“What gaps, misconceptions, barriers must I address, in order to help students achieve the intended learning outcome?”

- Objective:
- Time required:
- Needed instruction:
- Question/Assessment technique:
Ex. Trial attempt without instruction, Brainstorming, Picture Interpretation, Prediction, Checklist, Questioning

Plan the Post-Test, in order to answer:

“What did the learner learn?”

“Were the desired objectives accomplished?”

- Objective:
- Time:
- Needed instruction:
- Question/Assessment technique:
Ex. True/False, Multiple Choice, Matching, Fill-in the Blank, Short-written answer

Faculty Development Workshop
Lesson Plan Templates¹⁴

Bridge:			
Learning Objective:			
Pre-assessment:		Materials:	
Participatory Learning:			
Time	Instructor Activities	Learner Activities	Resources
Post-assessment:			
Summary:			

¹⁴ All templates from ISW Network (2012). Active Learning Strategies handbook

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Date: Title:		Resources	Time (minutes)
Bridge:			
Learning Objective:			
Pre-assessment:			
Instructor Activities	Learner Activities		
Post-assessment:			
Summary:			
What worked well/what needs revision:			

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Date: _____

Title: _____

Expressive Outcome:

Context: (Time)

Reflective Activity: (Time)

Reflective Process: (Time)

Documentation: (Time)

What worked/what needs revision?

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Course: _____

Date: _____

Topic: _____

Time: _____

Bridge		
Objectives:		
Pre-test:		
Resources:		Handouts:
Time	I Do	Students Do
Post-test:		
Summary:		
Assignment:		
Comments:		

Lesson Plan Examples

Title: Purposeful Communication – Knowing the Key Message		Date: June 5, 2014	
Bridge (1 min): Who has given a speech, presentation, talk or a lecture before? How about participating an interview? When the stakes are high, being anchored in your key message is critical. It's because in order to connect with your audience, you will have to be flexible to respond without losing focus or consistency.			
Learning Objective (0.5 min): By the end of this lesson, you will be able to state the key message in your current communication task, and deliver the key message through non-verbal and verbal means.			
Pre-assessment (1.5 min): Who can tell me how everyone is communicating a message to me, and the class, right now?		Materials: N/A	
Participatory Learning:			
Time	Instructor Activities	Learner Activities	Resources
5 min	Have students read instruction and clarify as needed. Keep time for their activity, done in groups of 2-3. Ask them to tell each other which message (a, b, or c) their peers were sending.	Answer, 'How would you let the other person know (a) that you value their input? (b) That you need their support? (c) That you understand where they're coming from? Choose one and make efforts to help the other person identify which message you're sending, while holding a conversation about your course experience.	1. PPT slide with images 2. Worksheet
Post-assessment (1.5 min): <u>One-minute paper</u> Your upcoming communication activity: _____ What will be your key message? _____			
Summary (0.5 min): Knowing my key message goes hand-in-hand with knowing the audience, and the purpose of the engagement. Knowing my key message will help me to respond to uncertainties with less			
What worked well/what needs revision:			

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Date: Title: Ni Production Methods		Resources	Time (minutes)
Bridge: Explain importance of Ni: growing need for this metal. Its magnetic and electric properties, alloys, high-temp resistance.		Diagram/Chart of Ni production & demand by country over past 20 years	1-2
Learning Objective: Be able to illustrate and label the main steps of the different production methods of Ni. Correctly perform heat balance of the process. Demonstrate the thermodynamic principles behind these methods.		PowerPoint slides	2
Pre-assessment: 1-5 Scale Question: How would you rate your ability to conduct a heat balance		I-clicker	3
Instructor Activities	Learner Activities		
Lecture – Ni production methods, thermodynamic principles of this Show diagrams and play videos of production and give explanation Solve example heat balance with help from students Create table comparing Ni to previously studied metals	Listen & take notes individually Participate in problem solving – invite students to write their solution on the board Ask questions referring to videos/diagrams for clarification if necessary Participate in table creation by suggesting input	PowerPoint slides Diagrams Videos of the different production methods Blackboard/Whiteboard	30
Post-assessment: 1-5 Scale repeated. Pose same question and compare results. Then, have students individually complete a simple, short heat balance and hand it in before they leave class. Correct them and hand them back beginning of next class.		I-clicker	10
Summary: The different methods and main steps of Ni production Thermodynamic principles behind this. Summary of heat balance			3
What worked well/what needs revision:			

Part 4: Mini-Lessons and Guided Feedback

Mini Lesson Cycle Procedures:

In groups of 3-4, you will be presenting your mini-lesson and receiving feedback from your peers/colleagues. Here is what to expect:

1. Facilitator will help ensure a proper setup for your mini-lesson. Please check the room arrangement, multimedia setup (if required), and decide how your facilitator can help you keep track of time.
2. Let your facilitator know which feedback form you chose. Your facilitator will ensure copies are distributed to your peers after your mini-lesson.
3. Deliver your five-minute mini-lesson.
4. Facilitator will escort you out of the classroom, debriefing with you to help you review what worked well, comment on any surprises, and identify top questions you have for your peers for 3-5 minutes.
5. You will return with the facilitator to the group, who are now ready with their feedback forms complete.
6. Facilitator will pose your top questions for feedback, and moderate the discussion for 5 minutes.
7. Upon completion of the feedback process, you will receive all the completed feedback forms.

Faculty Development Workshop
Mini-Lesson Feedback Forms¹⁵
Template A

Instructor: _____ Observer: _____

Lesson Topic/Title: _____ Date: _____

Please comment on the effectiveness of the following:

- Bridge-in

- Objective

- Pre-test

- Participatory learning

- Post-test

- Summary

Two items of special note:

- 1.
- 2.

Two suggestions you would make:

- 1.
- 2.

¹⁵ Adapted from Instructional Skills Workshop Handbook (ISW Network, 2006: 66-85). These resources are made available for use to certified facilitators of Instructional Skills Workshop (run by MIETL and similar offices at other institutions). Minha R. Ha became certified in May 2013.

Faculty Development Workshop
Template B

Instructor: _____ Observer: _____
Lesson Topic/Title: _____ Date: _____

1. What kind of learning environment did the instructor create?
2. What did the instructor do that created this learning climate?
3. How did the instructor encourage participation by the learner? Please include comments on the instructor's ability to use questioning techniques and learning activities.
4. What could the instructor do to increase the degree and quality of learner participation?
5. Comment on the instructor's ability to present material to the learners, considering: clarity, amount and order of material, use of examples, ability to word paint.

Faculty Development Workshop
Template C

Instructor: _____ Observer: _____

Lesson Topic/Title: _____ Date: _____

1. What instructional aids were being used during the lesson?
2. Were these aids used efficiently?
3. Were these aids helpful to you? Why or why not?
4. Can you suggest other aids or different ways of utilising instructional aids to enhance your learning? If so, what, when, how?

Faculty Development Workshop
Template D

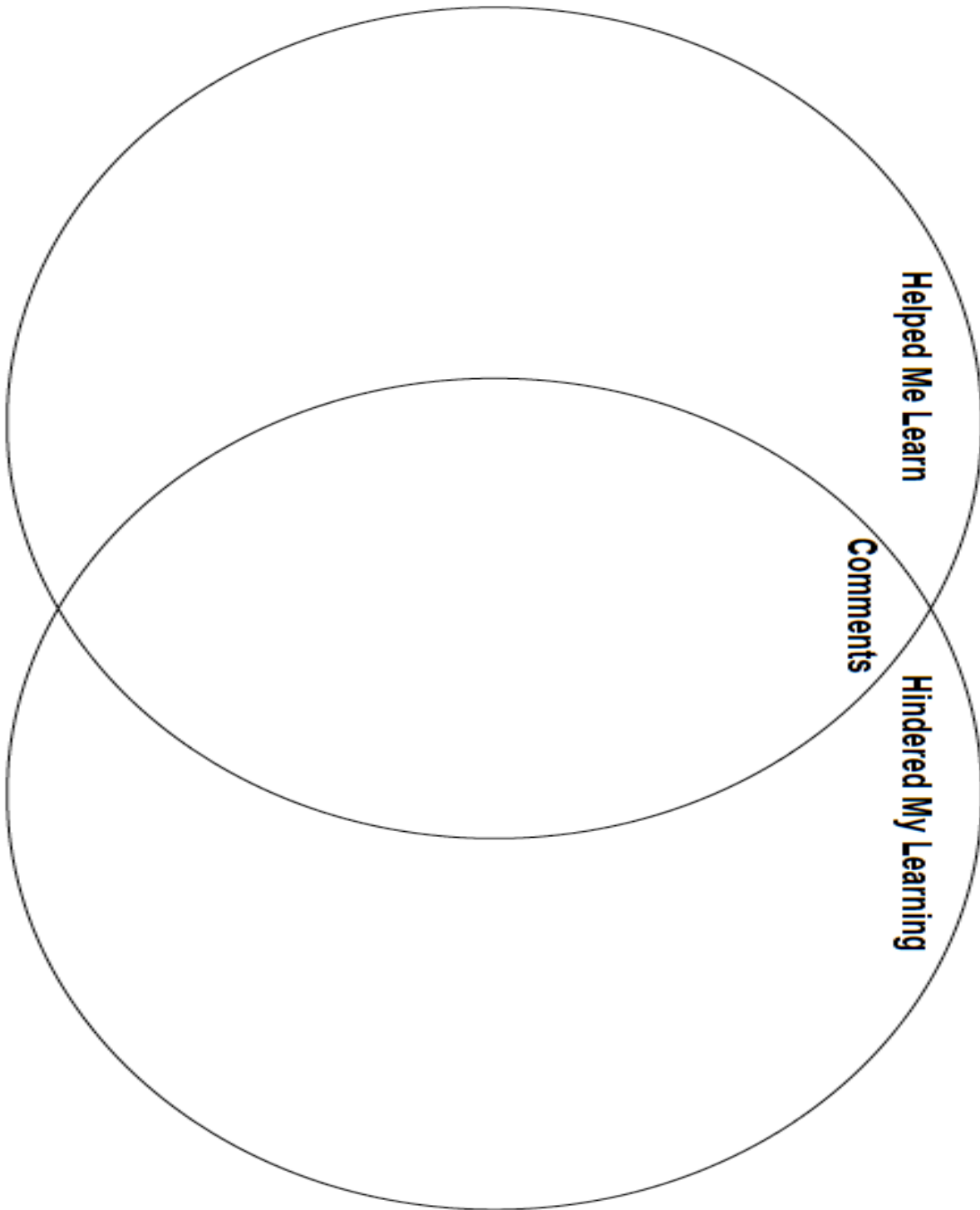
Instructor: _____ Observer: _____
Lesson Topic/Title: _____ Date: _____

1. What did the instructor do that helped participants learn?
2. What did the instructor have the students do, that helped them learn?
3. What could the instructor have done / had students do differently, that would have helped participants learn?
4. What could I (as a learner) have done differently to help myself learn better in this situation?

Faculty Development Workshop
Template E

Instructor: _____ Observer: _____

Lesson Topic/Title: _____ Date: _____



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Appendix A: Course/Teaching Feedback Form¹⁶

Below is Tom Angelo's student feedback form, shared with permission. When creating course evaluation questions for you students, it may be in your interest to begin with some self-reflective questions for the students to answer. Having students reflect on their own behavior first, will cause the students to approach the remaining questions differently.

1=Always, 2=Usually, 3=Sometimes, 4=Rarely, 5=Never, NA=Not Applicable

Questions about yourself

1. I was self-motivated to learn this course material.
2. I was well-prepared for each class session.
3. I asked the instructor for help/guidance when I needed it.
4. I invested enough time and energy to meet/exceed course requirements.
5. I participated actively and contributed thoughtfully in class sessions.
6. I attended class sessions and/or individual appointments.
7. Overall, I gave my best possible effort to learning in this course.

Questions about the course

8. The course was well-organized to help students learn.
9. The objectives and criteria for meeting them were made clear.
10. The assignments contributed to my learning.
11. The assessments/evaluations were clearly connected to the objectives.
12. The amount of work required was appropriate to the objectives.
13. The level of intellectual challenge was high.

Questions about the instructor

14. The instructor clearly connected the course objectives to course activities, assignments, and assessments.
15. The instructor encouraged me to connect my experience to the course.
16. The instructor provided clear and useful feedback to improve learning.
17. The instructor inspired interest and excitement in the course material.
18. The instructor was available and helpful when asked.
19. The instructor communicated ideas and information clearly and effectively.
20. The instructor evaluated and graded fairly.
21. The instructor treated students and their ideas with respect.
22. The instructor used required texts/other required materials effectively.

Summary Questions: Compared with other courses

1=Extremely high, 2=High, 3=Adequate, 4=Low, 5=Very low

23. This course increased my desire to continue learning about this material.
24. If a friend asked about taking this course, my recommendation would be...
25. Overall, I would rate the quality of this course as...
26. Overall, I would rate the effectiveness of the instructor as...
27. Overall, I would rate the amount I learned in this course as...
28. Overall, I would rate the value of what I learned in this course as...

¹⁶Angelo, T.A.,(2014), Seven Levers for Higher and Deeper Learning, Workshop presented at Teaching and Learning Innovation Conference, University of Guelph, 31 April - 1 May

Appendix B: Maintaining Academic Integrity

Academic dishonesty of any kind is considered a very serious offense at McMaster, and should be treated as such. Be sure to know McMaster's specific policy. Academic dishonesty should be discussed on the first day of class and outlined in your syllabus with a reference to McMaster's Office of Academic Integrity. But, the best way to prevent academic dishonesty is by having students engaged in the class!

It is not only the instructor's attitude that contributes to a positive environment, but also consider the structure, design and grading of assessments. One of the most common causes of students cheating is when they *perceive* either unfairness or unrealistic expectations in the assignment. It is not the reality of fair or realistic, but the *perception* of this from the student. Therefore, in order to minimize the likelihood of cheating, assessments should be fair and realistic both in reality and in the minds of the students. Expectations for the students should be high, but not too high. Assessments should be challenging, but not so challenging that students will feel overwhelmed with its difficulty. For assessments to be fair, the content should be relevant, and the time should be allotted should be appropriate. When assessments are fair and realistic, the reason it may not be perceived as such by the student is due to lack of communication. Expectations of the student need to be clearly articulated by the instructor, whether it be verbally or on paper with listed objectives and/or a rubric. Giving students feedback and time for reflection are especially important for long projects or big assessments/tests.

A student with a positive outlook on the class is much less likely to cheat than a student with negative feelings towards the class. Alienation, emotional distance, resentment, lack of trust/inclusion are some examples of negative emotions a student may have towards a class. It is the responsibility of all parties to prevent this behaviour and attitude. It is the university's responsibility to give both students and faculty an academic environment in which they feel safe and able to teach and learn. It is the responsibility of the instructor to use positive language and to have a positive attitude towards teaching their students. By welcoming mistakes and group learning, the instructor is promoting participation, experiential learning and student community building.

The following tables present our working frameworks (June 5, 2014) of conceptualising factors to academic integrity and student engagement.

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Key Considerations for Promoting Academic Integrity

	Student	Instructor	External
Fairness	<ul style="list-style-type: none"> Fair contribution in groups Treat the course as important 	<ul style="list-style-type: none"> Time allotted Content relevance Grade allocation 	<ul style="list-style-type: none">
Clarity	<ul style="list-style-type: none"> Self-awareness Clear expectations articulated 	<ul style="list-style-type: none"> Communicates expectations Gives feedback Gives reflection for student on assessment 	<ul style="list-style-type: none">
Realistic	<ul style="list-style-type: none"> Using resources Priorities (time, work ethic..etc.) 	<ul style="list-style-type: none"> Reasonably high expectations Connect to big picture 	<ul style="list-style-type: none"> Scheduling of course assignments
Connection	<ul style="list-style-type: none"> Motivation Belonging to class 	<ul style="list-style-type: none"> Language Attitude Welcome mistakes & group learning 	<ul style="list-style-type: none"> Physical environment (appropriate classroom size, well lit, etc.) Refer to planning checklist

Disengagement to Re-Engagement

	Indicator in Student Behaviour	Possible Instructor Response
Belonging	<ul style="list-style-type: none"> Emotional distance, not a part of the classroom “community” 	<ul style="list-style-type: none"> Promote peer learning activities Encourage group collaboration on certain assignments or problem sets
Doing	<ul style="list-style-type: none"> Not doing what’s expected of them Not doing what’s constructive (not participating) Doing what’s unconstructive (ex. Facebook) 	<ul style="list-style-type: none"> Change or adapt lesson structure and/or assessments
Sensing	<ul style="list-style-type: none"> Not listening, not watching Focused on distractions 	<ul style="list-style-type: none"> Policy and norm-setting + reinforcement Mixed multimedia
Feeling	<ul style="list-style-type: none"> Anger, frustration, distance, isolation, unresponsive 	<ul style="list-style-type: none"> Making a connection with students Take a more informal approach
Knowing	<ul style="list-style-type: none"> Passive, unfocused, apathetic 	<ul style="list-style-type: none"> Break from lecture Group activity
Being	<ul style="list-style-type: none"> Misaligned vision of education & profession 	<ul style="list-style-type: none"> Self-identification Valuing the students, believing in their potential

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Appendix C: Classroom Management

Establishing rapport with students and creating a positive, purposeful classroom climate plays a critical role in the facilitation of learning, and the prevention of spontaneous conflict in the classroom. Many factors could be linked to student behaviour – for example, feeling alienated from other members of the class and distant from the interests or attention of the teacher may promote either a provocative or extremely passive behaviour in class¹⁷. At least one of the elements in a positive, constructive learning environment can be directly linked to instructor behaviour, such as the “caring” — if students think the instructor cares about them and their learning, they will be more positively disposed to the course and the instructor¹⁸. The consideration of experiential dimensions and lesson planning are expected to greatly enhance the instructor’s ability to respond effectively to challenges in the classroom.

The following table is a derivative of Rodriguez’s¹⁹ work on organising commonly encountered challenges in the classroom, and possible ways of responding to them. This is a working table, incorporating examples from our faculty and staff.

<u>Issue</u>	<u>Suggested Actions</u>
Academic Dishonesty	Clearly state McMaster’s academic dishonesty policy both in the course syllabus and in person on the first day of class. Let them know that academic dishonesty is a serious offence and it will not be tolerated. However, clearly define the difference between cheating and collaborating. For many courses will may want to encourage peer-to-peer collaboration.
Cell phones and Food	Most instructors allow cellphones set to vibrate in their class, as long as it isn’t a distraction to the student, to their peers and to the instructor. Some instructors may enforce a stricter policy of no cellphones in class at all. Ultimately, the extent of cell phone use as well as food in class is up to the discretion of the instructor. They should communicate their preference on the first day of class so everyone is clear on the rules.
Disinterest/ not paying attention	When this is a persistent problem, you need to inform your students that their behaviour is disrespectful to you. Try and praise students who are engaged and interested for their attention. This conveys the message to the rest of the class as well.
Late to Class	On the first day of class, let students know your policy on tardiness. Be sure to account for students who have valid reasons for being late, such as another class immediately prior to yours.
Monopolizing Discussions	This will be a common and recurring problem during your classes. Some students may be very engaged and talkative, may ask many questions and attempt to answer all of yours. It is important to let them know that you appreciate their enthusiasm. Ask for them to stay after class one day and tell them that you appreciate their enthusiasm, but ask if they have any ideas on how to get the rest of the class as engaged as them. This is a polite and friendly way of letting them know that they are monopolizing class discussions, without discouraging them.

¹⁹ Kearney, P., & Plax, T. (1992). *Power in the classroom*. Hillsdale, NJ: Erlbaum.

²⁰ Feldman, K. A. (1989). Instructional effectiveness of college teachers as judged by teachers themselves, current and former students, colleagues, administrators, and external (neutral) observers. *Research in Higher Education* 30: 137–194.

¹⁹ Rodriguez L. (undated). Classroom Management. [<http://www.4faculty.org/includes/108r2.jsp>] Retrieved May 30, 2014.

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Noise	It is important to be aware of the difference between a student clarifying the topic to another and students who are socializing. Before beginning the lesson, let students know that you have a lot of material to cover and that you appreciate their attention in the lesson. It is always crucial to keep a positive tone. Students will respond better to positive feedback rather than negative feedback, or punishment. Reaffirming the behaviour of attentive and engaged students can have a significant effect on the disengaged students of the class.
Overt Conflict or Verbal Aggression between Students	Instructor reaction sends strong messages to the rest of class. Aggressive behaviour should not be tolerated, but questioned if not corrected immediately. Maintaining respect and benefit-of-the-doubt is also important to encourage positive behaviour from both the aggressor and the ones being verbally attacked. Some conflicts are best tackled after class, and some demand to be addressed immediately, in class. Be careful not to humiliate or embarrass a student in front of the rest of the class. This will surely reduce the likelihood of participation from all students in future classes.
Refusal to Participate	You cannot force a student to actively participate in class. However, you can encourage shy students to participate by carefully coaxing a response from them and praising whatever effort they make. They may become more confident in participating in class, but ultimately, there will inevitably be students who will never want to speak in class.
Sleeping in Class	Most instructors agree that students sleeping in class should not be tolerated. Ask a nearby student to wake them up, and continue on with the lesson. If they fall asleep again, ask them to stay after class. Do not scold or punish the student, instead, politely ask them if they aren't feeling well. The key to this is to show that you are truly concerned for them. It likely won't happen again. If it is a long class, take a 5-10 minute break in the lesson and let students talk, walk around and get water. Letting them get out of their chair even for just 5 minutes will re-energize them.
Undermining your authority	A student may be confrontational or challenge your authority in class. Do not fall into their trap; keep your cool. After class, ask them to stay behind and explain to them that their attitude is detrimental to the class environment and ask them how this conflict can be mutually resolved. Keeping your cool and staying calm conveys confidence and control. Calmly reassuring them that you understand where they are coming from, and asking them to reflect on your position in this situation can quickly diffuse the situation.
Verbal or Physical Threats	In the rare situation of a clear verbal or physical threat, clearly state any threat is taken very seriously, even if it seems part of a joke. Make note of students involved. Consult the department chair and/or the Assistant Dean at the Faculty, and have a clear action plan for immediate response or for future incident.

Appendix D: Classroom Planning Checklist²⁰

Belonging

- I am clear on the tone I want to set in the beginning of class.
- I know what kind of peer-peer and peer-instructor relations I expect/encourage. I know how I will communicate this.
- I know what roles I and my students will take on. I have a clear view and expectation of my students (e.g. engineers, citizens, collaborators in education).

Doing

- I know what students are going to be doing in this class/session.
- I have prepared structured learning activities which will facilitate student learning.
- The students are prepared for the learning activity. I am prepared as well.

Sensing

- I am aware of how the physical environment might affect student learning (e.g. room echo, ambient noise, lighting, seat adjustability).
- I am aware of how my teaching aid materials will affect student learning (e.g. content level and organization in PPT, clarity of instructions on learning activities).

Thinking

- I know how students will keep track of their progress during class (e.g. self-assessment).
- I will be able to check/view student progress in their cognitive development.
- I am aware of the gap between me and my students in terms of expertise/mastery. I have the information needed in order to identify the gap.

Feeling

- I know how students will make personal connections with the content/goals of the session/course.
- I am aware of the kind of emotional reactions that are intended by the presented materials, the tone and the tasks, for the sake of learning.

Being/Becoming

- I have a vision for the kind of engineers I want my students to become.
- I know what kind of values, perspectives, skills and knowledge connect to the identities of: a learner, professional, global citizen & engineer.
- I have planned how I will demonstrate or communicate, and how students will articulate the transformative outcomes.

²⁰ Developed with faculty input, adapting to Beard's (2010) Model, May 24, 2014