Agile Capacity Building for Residential Energy Efficiency in a VUCA World

(Volatile, Uncertain, Complex and Ambiguous)

Kirk Johnson, Professor / Program Director
Humber College, Toronto, Canada

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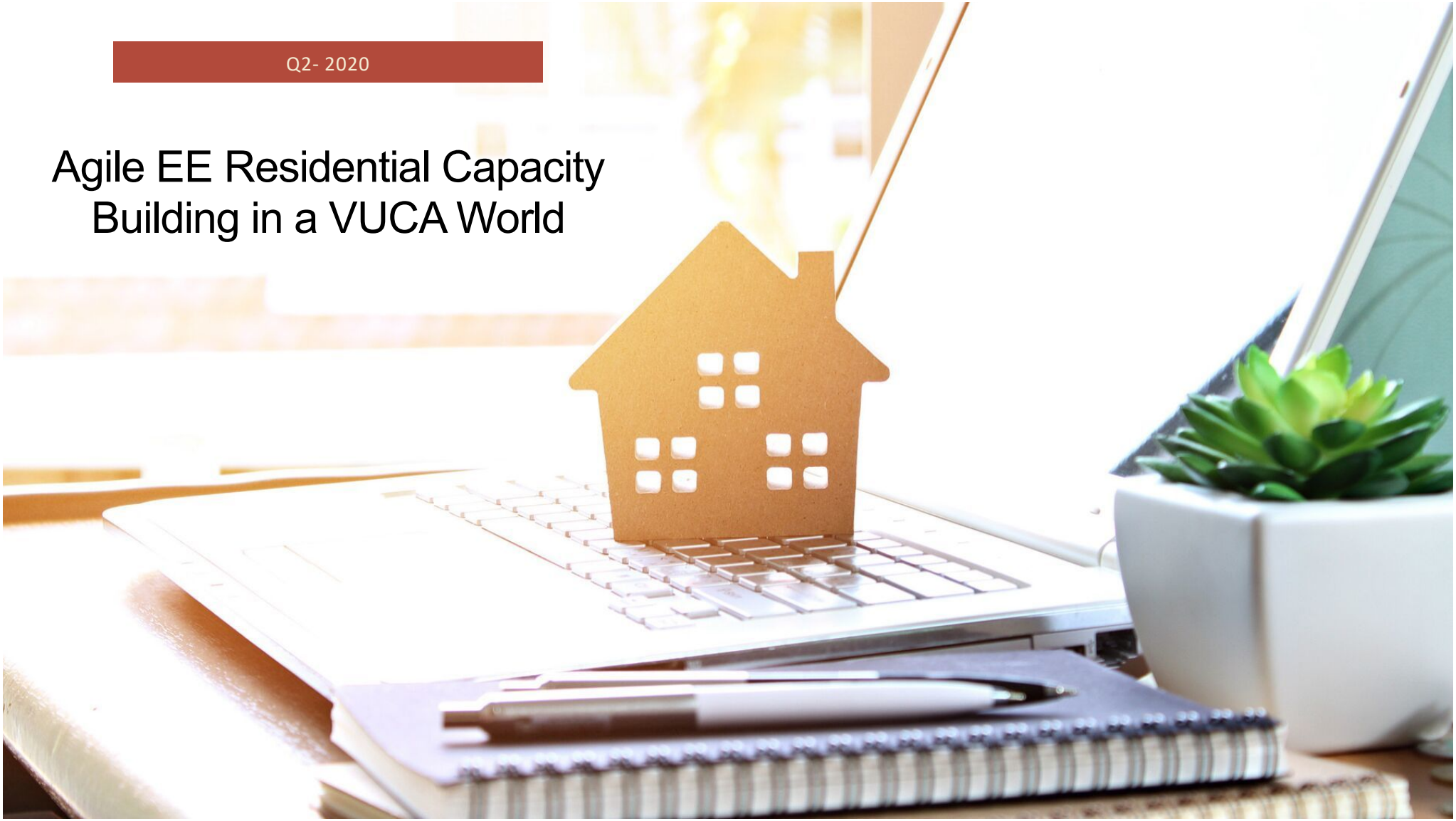
Q2- 2020

Agile EE Residential Capacity Building in a VUCA World



Agenda

- Overview
- HUMBER Agile EE Capacity Building Programs
  - Hit the (EA Certification) **BOOT CAMP**
  - Bring the **HEAT**
  - Create Homeowner & Community **HEROES**
  - **DEPloy** Interactive Mobile Homeowner Engagement
- Adapting to the **#NewNormal**

SPRING 2020 - HUMBER RESIDENTIAL ENERGY EFFICIENCY CAPACITY BUILDING PORTFOLIO

GREEN = ACTIVE PROJECTS

ORANGE = IN DEVELOPMENT

ABOUT HUMBER

At Humber, we offer our students a polytechnic education. We teach theory, add in practical, hands-on training and work with employers to give students opportunities to learn in real world settings. Set in state-of-the-art and creative learning spaces, this unique approach unleashes innovative and entreprenuerial thinking and prepares students for the careers of today and tomorrow.

186
full-time students
Orangeville Campus

ORANGEVILLE

20,878
full-time students
North Campus

TORONTO

12,305
full-time students
Lakeshore Campus

3 CAMPUSES

Humber is the first public college in Canada to adopt the Okanagan Charter

33,000+ full-time students

23,000+ part-time and continuing education students

110,000+ program applications annually

1,800 apprenticeship students

1,400 students in residence

more than **200** full-time programs

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APPLIED RESEARCH AND ENTREPRENEURSHIP

More than
$3.3 million
total research budget

149 faculty & staff

720 students &

80 external partners involved

in **420** applied research projects

1
Centre for Entrepreneurship

1,070
active entrepreneurs

66
new start-ups funded (of which 22 were a part of the 2017-2018 Launch Me competition)

CENTRES OF INNOVATION

Where teams of expert faculty and students come together to help businesses and communities prosper

- Barrett Centre for Technology Innovation
- Centre of Innovation in Health and Wellness
- Centre for Creative Business Innovation

BARRETT CENTRE FOR TECHNOLOGY INNOVATION - NORTH CAMPUS

(Open April 2019)

93,000 sq ft of purpose-built collaborative space that is a skills training hub for advanced manufacturing and Industry 4.0.

PROGRAM FACILITATORS

Kirk Johnson

Adjunct Professor, Sustainable Energy & Building Technology (SEBT)
Adjunct Professor, Information & Computer Technology (ICT)
Project Director, EARTH, HERO, EA Bootcamp & HEAT Programs

Sustainability Director with 17 years experience managing 15+ high-profile Market Transformation programs across Canada addressing Capacity Building Innovation/IT/Sustainability/Incentive/Training opportunities in the building sector. Sponsor/Funding agencies for his $200+ million in cumulative program budgets include **NRCan, Canada Green Building Council (CaGBC), City of Toronto, Ontario Power Authority/IESO**, **Heating, Refrigeration and Air Conditioning Institute of Canada (HRAI), Ministry of Energy (MOE), EnerQuality,** and **Humber College**

In addition to teaching **SEBT** sustainability courses and **ICT** Project Management at Humber since 2014, Kirk has been a Program Lead or Key Contributor to leading national/provincial policies, programs, & standards including the award-winning **Toronto Green Standard** (TGS), Canadian Home Builder Association's **Net Zero Energy** (NZE) house standard, Toronto **Better Buildings Partnership (**BBP) Incentive programs, Canada Green Building Council's **GREEN UP** program NRCan's **Portfolio Manager** program, Ontario Home Builders' **Green Streets** Program/**ENERGY STAR for New Homes** (ESNH)/**Energy Star for Multi Family** (ESMF) programs, and recently **Humber College** for their **Energy Advisor Boot Camp HEAT, and HERO** Program.

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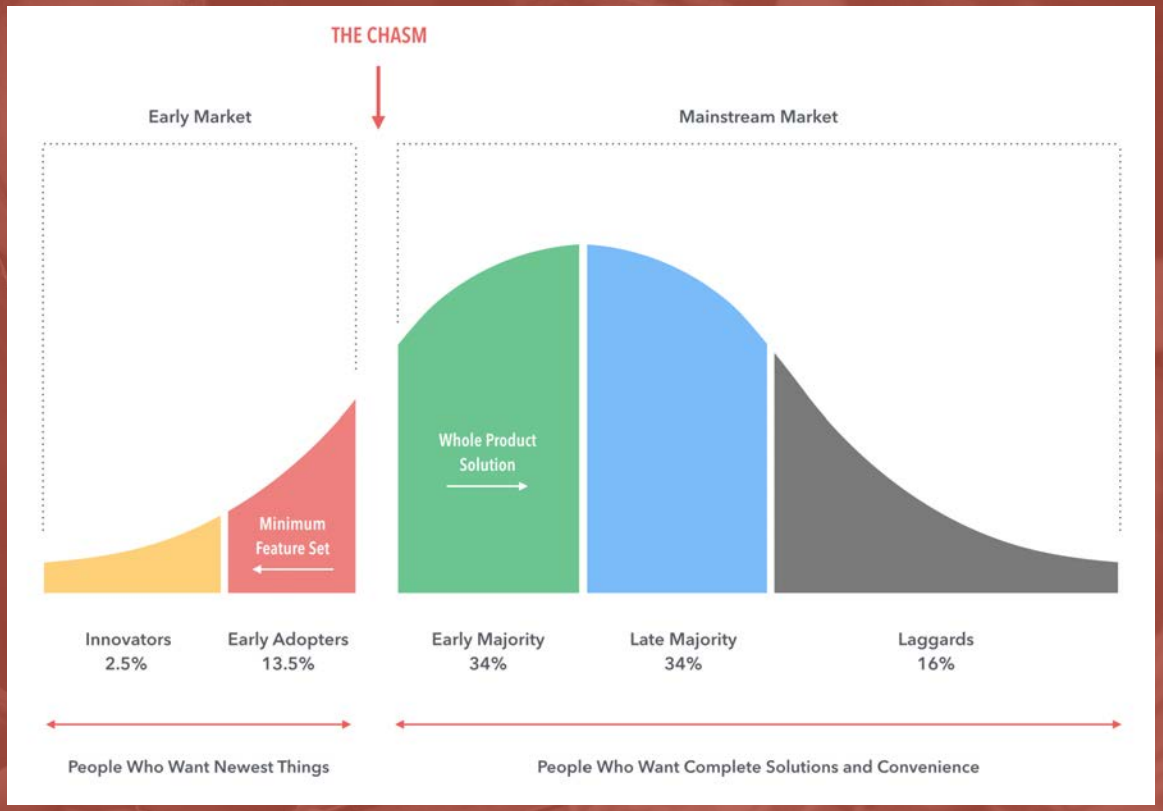
It’s a VUCA World

“We are moving from a world of problems, to a world of dilemmas”

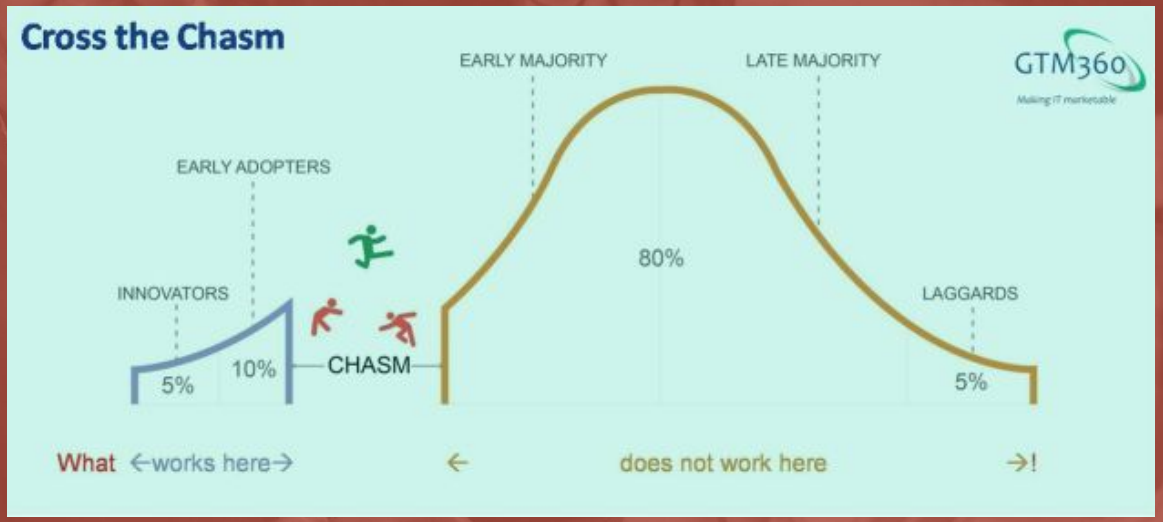

VUCA environment
VOLATILITY = V
UNCERTAINTY = U
COMPLEXITY = C
AMBIGUITY = A
V = VISION
U = UNDERSTANDING
C = CLARITY
A = AGILITY
VUCA Prime Model

CROSSING THE CHASM FOR TECHNOLOGY ADOPTION AND MARKET TRANSFORMATION



CROSSING THE CHASM FOR TECHNOLOGY ADOPTION & MARKET TRANSFORMATION

SCALING CHALLENGES



Agile Residential EE Capacity Building Program Portfolio

Winter 2020

SPRING 2020 - HUMBER RESIDENTIAL ENERGY EFFICIENCY CAPACITY BUILDING PORTFOLIO

GREEN = ACTIVE PROJECTS

ORANGE = IN DEVELOPMENT

Energy Advisor Capacity Building Program

Market Name: Energy Advisor Bootcamp

Customer Segment: Residential

Program Pass Rates

4% Passed Intake Exam
70% Passed Exit Exam

Score Improvement

18 Average Score Increase
57% Average Intake Score
75% Average Exit Score

Program Description

The **Energy Advisor Bootcamp** prepares participants for the NRCan Foundation Level Exam, with intensive training sessions that that cover all 200+ NRCan Learning Outcomes

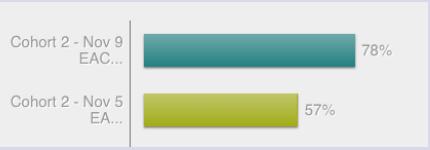
The 5-Day program is delivered by veteran Humber Sustainability Instructors and NRCan Certified Energy Advisors

Program Evaluation

92% Course Rating

86% Would Recommend the Energy Advisor Bootcamp to a Peer

Sample Cohort Intake/Exit Scores



Daily Schedule – Detailed Day 2

Detail Agenda

Day	LO Codes A..	LO Codes A..	LO Codes A..	Category / Competency / Learning Objective	
2A	3	Null	Null	3.3 Describe renovation techniques using appropriate construction terms and definitions.	
				3.4 Recognize highly efficient design principles for new construction and renovation.	
				3.5 Interpret plans.	
		3	1	3.3.1 List potential house-as-a-system implications when assessing renovation options.	
			2	3.3.2 Describe the advantages and disadvantages of adding insulation to the exterior versus the i..	
			3	3.3.3 Identify the sub-trades involved in energy efficiency renovations.	
		4	1	3.4.1 Describe how integrated design can lead to optimal building performance.	
			2	3.4.2 Describe a highly efficient building envelope.	
			3	3.4.3 Describe highly efficient mechanical systems, including how they can be integrated.	
			4	3.4.4 Describe alternatives to conventional central or window-type air conditioning.	
			5	3.4.5 List opportunities for reducing hot water use and hot water delivery time delays through effi..	
			6	3.4.6 List opportunities for reducing total water consumption.	
			7	3.4.7 List options for reducing lighting loads.	
			8	3.4.8 Describe opportunities to reduce electrical loads.	
			9	3.4.9 Describe renewable energy options for housing.	
			10	3.4.10 Describe ways that photovoltaic systems can be integrated into the structure of the building.	
			11	3.4.11 Describe construction and renovation practices and materials to control air leakage.	
	7	Null	Null	7.2 Describe the physical processes that occur within a building.	
				7.3 Describe the diagnostic indicators of indoor air pollutants.	
		2	1	7.2.1 Describe comfort as it applies to an indoor environment for people.	
			2	7.2.2 Describe specific heat, sensible heat and latent heat.	
			3	7.2.3 State the necessary conditions for heat flow to occur.	
			4	7.2.4 Describe the relationship between R-value and U-factor.	
			5	7.2.5 Describe convection and provide typical examples in a house.	
			6	7.2.6 Describe conduction and provide typical examples in a house.	
			7	7.2.7 Describe radiation and provide typical examples in a house.	
			8	7.2.8 Describe condensation.	
			9	7.2.9 Describe evaporation.	
			10	7.2.10 List the three main factors of the environment that affect the rate of body heat loss.	
			11	7.2.11 Describe energy and its relationship to heat.	
			12	7.2.12 Describe typical internal heat gain sources.	
			13	7.2.13 Describe how heat flow through the building envelope affects thermal comfort and energy c..	
		3	1	7.3.1 Describe different types of indoor pollutants and their potential impact on the health of occu..	
			2	7.3.2 Identify potential sources of indoor air pollutants.	
			3	7.3.3 Describe methods to minimize indoor air quality problems.	
			4	7.3.4 Describe combustion spillage and its implications.	
			5	7.3.5 List and identify the signs of combustion spillage.	
			6	7.3.6 Identify factors that cause combustion spillage.	
			7	7.3.7 Describe methods to reduce or prevent combustion spillage.	
			8	7.3.8 Describe carbon monoxide poisoning hazard and use of fire/smoke/CO2 alarms.	
			9	7.3.9 Describe the health hazards of asbestos.	
			10	7.3.10 Provide some examples of materials that contain asbestos.	
			11	7.3.11 List the causes of mould.	
			12	7.3.12 Describe the concerns of mould.	
			13	7.3.13 List the sources of radon.	
			14	7.3.14 Describe the concerns of radon	
			15	7.3.15 List the causes of excessive moisture.	
			16	7.3.16 Describe the concerns of excessive moisture.	

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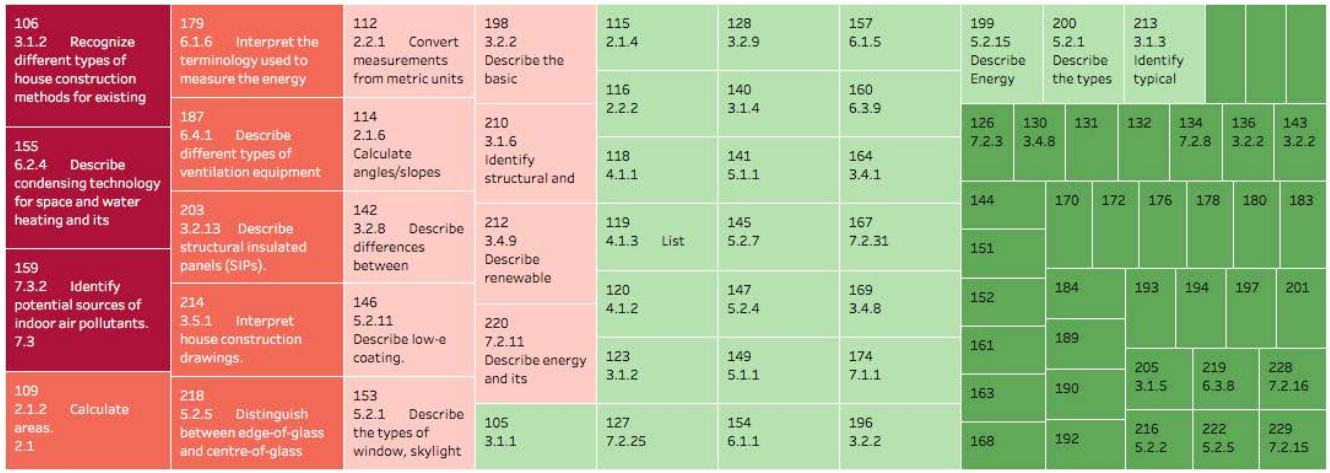
Intake Learning Gap Dashboard – Cohort 2

Heat Map



Candidate Name
All

Answer Binary
0 5

Answer Binary
2
10
20
30
40
46

Answer Binary
2 46

LO Test Details -C2

LO Code (Sh..	Category / Competency / Learning Objective		QID - C..	
3.2	3.2.2	Describe the basic components of light wood frame construction.	198	3
	3.2.8	Describe differences between foundation damp proofing and water proofing.	142	3
	3.2.9	Describe foundation drainage systems.	128	2
	3.2.12	Describe insulated concrete forms (ICFs).	138	0
	3.2.13	Describe structural insulated panels (SIPs).	203	4
3.3	3.3.1	List potential house-as-a-system implications when assessing renovation options.	204	0
3.4	3.4.1	Describe how integrated design can lead to optimal building performance.	164	2
	3.4.6	List opportunities for reducing total water consumption.	209	0
	3.4.8	Describe opportunities to reduce electrical loads.	130	1
			169	2
	3.4.9	Describe renewable energy options for housing.	212	3
	3.4.11	Describe construction and renovation practices and materials to control air leakage.	207	0
3.5	3.5.1	Interpret house construction drawings.	211	0
			214	4

Cohort Section Analysis - C2

LO Codes A..	
3	46
6	30
5	30
7	25
2	15
4	4
Null	2

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C2 Heat Map

Detail LO (3)

LO C..	Category / Competency / Learning Objective	QID - Candi..	Question text	
3.2	3.2.2 Describe the basic components of light wood frame construction.	143	What is the purpose of a knee wall?	1
		198	A wall that is not full height, in the a..	1
	3.2.5 Describe advanced framing and double stud..	133	The most important concept of adva..	1
	3.2.8 Describe differences between foundation d..	142	What is the purpose of damp proofin..	1
	3.2.9 Describe foundation drainage systems.	128	Which of these are NOT part of a pro..	1
	3.2.12 Describe insulated concrete forms (ICFs).	138	What is the name of this wall assem..	1
3.4	3.4.5 List opportunities for reducing hot water u..	135	Which of these are NOT part of an ef..	1
	3.4.8 Describe opportunities to reduce electrical loads.	130	In a natural gas/propane heating sys..	4
		169	In a natural gas/propane heating sys..	2
3.5	3.5.1 Interpret house construction drawings.	214	Which drawing is best to show the h..	3
		211	Which drawing is best to show the la..	2
5.1	5.1.1 Describe the function of each of the barrier ..	152	Air barriers are intended to?	2
	5.1.5 Describe the function of gaskets and list so..	148	What are desirable characteristics f..	1
5.2	5.2.1 Describe the types of window, skylight and ..	200	What are the two basic types of win..	1
	5.2.4 Describe the factors that affect the energy	147	What affects the U factor of window..	1

Exit Learning Gap Dashboard – Cohort 2

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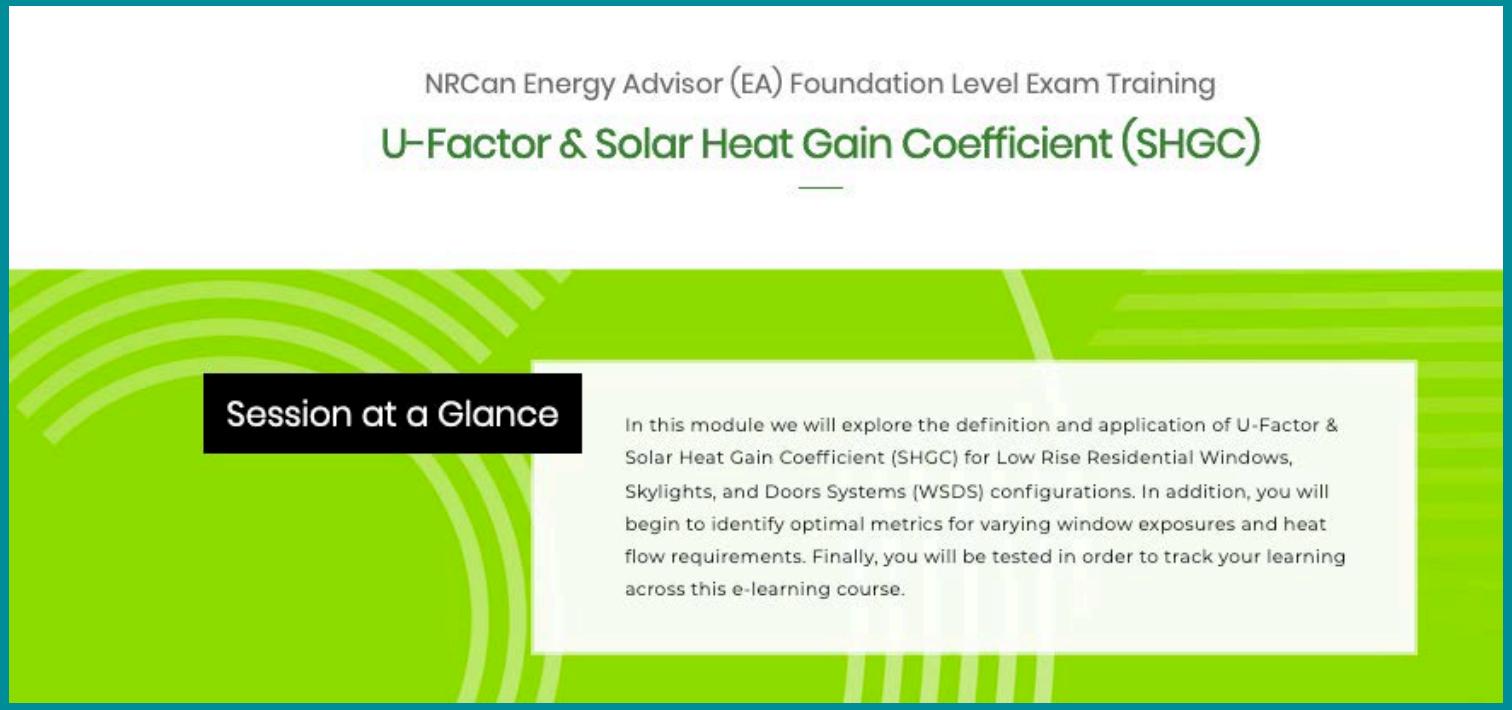
Windows eLearning Sample Module



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Windows eLearning Sample Module

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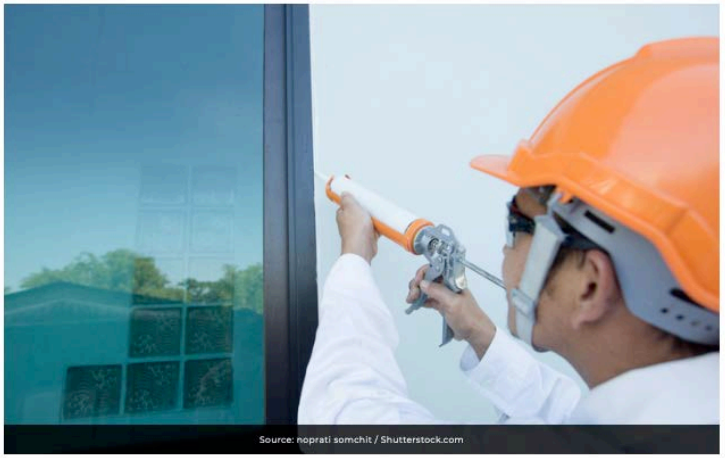
Windows eLearning Sample Module

Optimizing Energy Rating and the Factors that Affect the Energy Efficiency of Windows, Skylights, and Doors Systems (WSDS)



Source: noprati somchit / Shutterstock.com

This section focuses on the process of identifying the best performing windows with specific consideration to Energy Rating and the impact of **U-Factor, Air Leakage, and SHGC** on ER values.

A window's Energy Rating (ER) is a measure of its overall performance, based on three factors:

1. solar heat gains
2. heat loss through frames, spacers, and glass
3. air leakage heat loss.

Air Leakage – Heat is lost when the air moves through the seals or gaps in the frame. Air leakage may also occur around the frame due to poor installation. Air leakage from poor installation is a significant contributor

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Home Efficiency Animator Training (HEAT)

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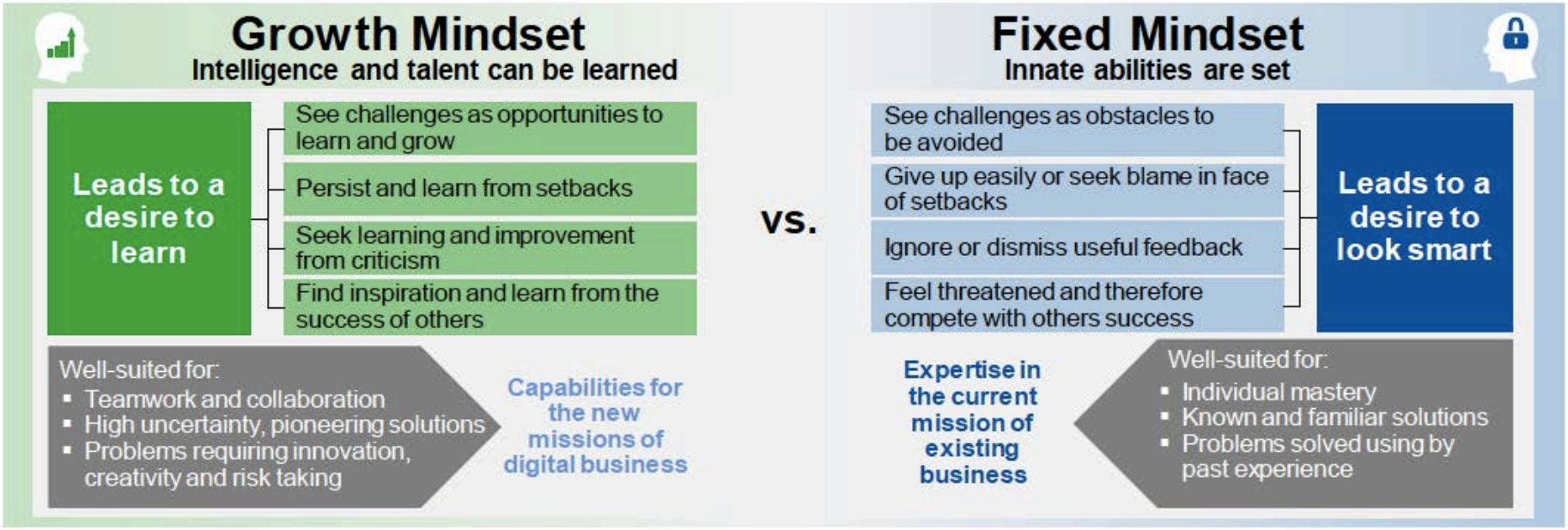
Home Efficiency Animator Training (HEAT)

HEAT:

A two-day, 14-hour, no-cost, capacity building program focused on best practices in residential energy conservation.

- **Audience:** Community/Sustainability Leaders, Municipal/Community Staff to:
  - Better understand retrofit best-practices, including low-cost and energy savings measures;
  - Understand and explain the greenhouse gas emissions reduction, energy, and economic benefits of energy upgrades;
  - Understand key concepts from Natural Resources Canada's home energy efficiency learning outcomes; and
  - Apply these concepts in their communities to increase energy efficiency
- **Purpose:**
  - To help increase community-wide conservation literacy and engagement.
  - An opportunity to connect with a network of fellow learners, professionals and change-makers focused on creating opportunities to drive energy efficiency and retrofitting.
  - For individuals looking to expand their skills and experience toward a career in energy efficiency, sustainability, green building and/or building sciences.

Foster a Growth Mindset …



… to Unleash a Continuous Learning Culture

Adapted from Carol Dweck

Gartner

Add a little bit of body text

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Home Energy Efficiency Capacity Building Program

Market Name: Home Energy Retrofit Orientation (HERO)

Customer Segment: Residential

Retrofit Topics Covered

- Heating Measures
- Envelope Measures
- Windows Measures
- Domestic Hot Water Measures
- Energy Audits
- Financing/Rebate Programs

Program Description

The **Home Energy Retrofit Orientation (HERO)** Program bridges energy efficiency literacy gaps, increases home-owner AIDA (Awareness/Interest/Desire/Action), and accelerates deeper multi-measure sustainability & energy conservation retrofits.

The HERO sessions are delivered by a veteran Humber Sustainability Professor and NRCan Certified Energy Advisor

Program Elements

- Home Energy Animator Training (HEAT) Program Materials adapted for non-technical Home Owners
- Infrared Heat Loss Demo
- Online Windows E-learning Module
- Interactive Digital Engagement
- Pomodoro Training Best Practices

Program Targets

- 4 Partners
- 400+ Session Participants
- 5000 Person Digital Online Reach
- 50% Energy Efficiency Literacy Improvement

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Residential Capacity Building

Name: **Local HEROES** (Home Energy Retrofit Orientation)

Customer Segment: Part 9 Homes

Retrofit Topics Covered:

- **Heating Measures**
- **Envelope Measures**
- **Windows Measures**
- **Domestic Hot Water Measures**
- **Audit / Incentive / Financing Info**

Retrofit Levels:

- **Low Cost Measures - Renters**
- **Targeted Measures - Early Majority**
- **Deep Retrofits - Early Adopters**

Project Elements

- **1 HEAT Session**
- **4+ HERO Sessions -**
  - **2+ for Pre-Audit Homeowners**
  - **2+ for Pre-Project Homeowners**
- **Online ERS Audit Pre/Post Metric Tracking**
- **Community Aggregation Dashboards**
- **Humber Grad Community Support**
- **Agile Project Management**

Project Targets

- **30 Neighborhood Leaders, Researchers, and Muni Staff trained**
- **4 Neighborhoods**
- **400 Homeowner Participants**
- **50% Energy Efficiency Literacy Improvement**

Program Description

The **Local HEROES** (Home Energy Retrofit Orientation with Engagement Support) Project bridges Early Majority literacy gaps, increases home-owner AIDA and accelerates multi-measure energy conservation retrofits and financing using best practice applied research methodologies.

The project will support 4 Communities via **HERO**, Humber SEBT Graduate Support, and an online platform to track/support retrofit measures and anonymously aggregate community level KPI for energy/GHG reductions. Neighborhood Community/Sustainability Leaders, Humber Grads, and Muni Staff will be trained via one **HEAT** Session

Adapting to the **#NewNormal**

Spring 2020

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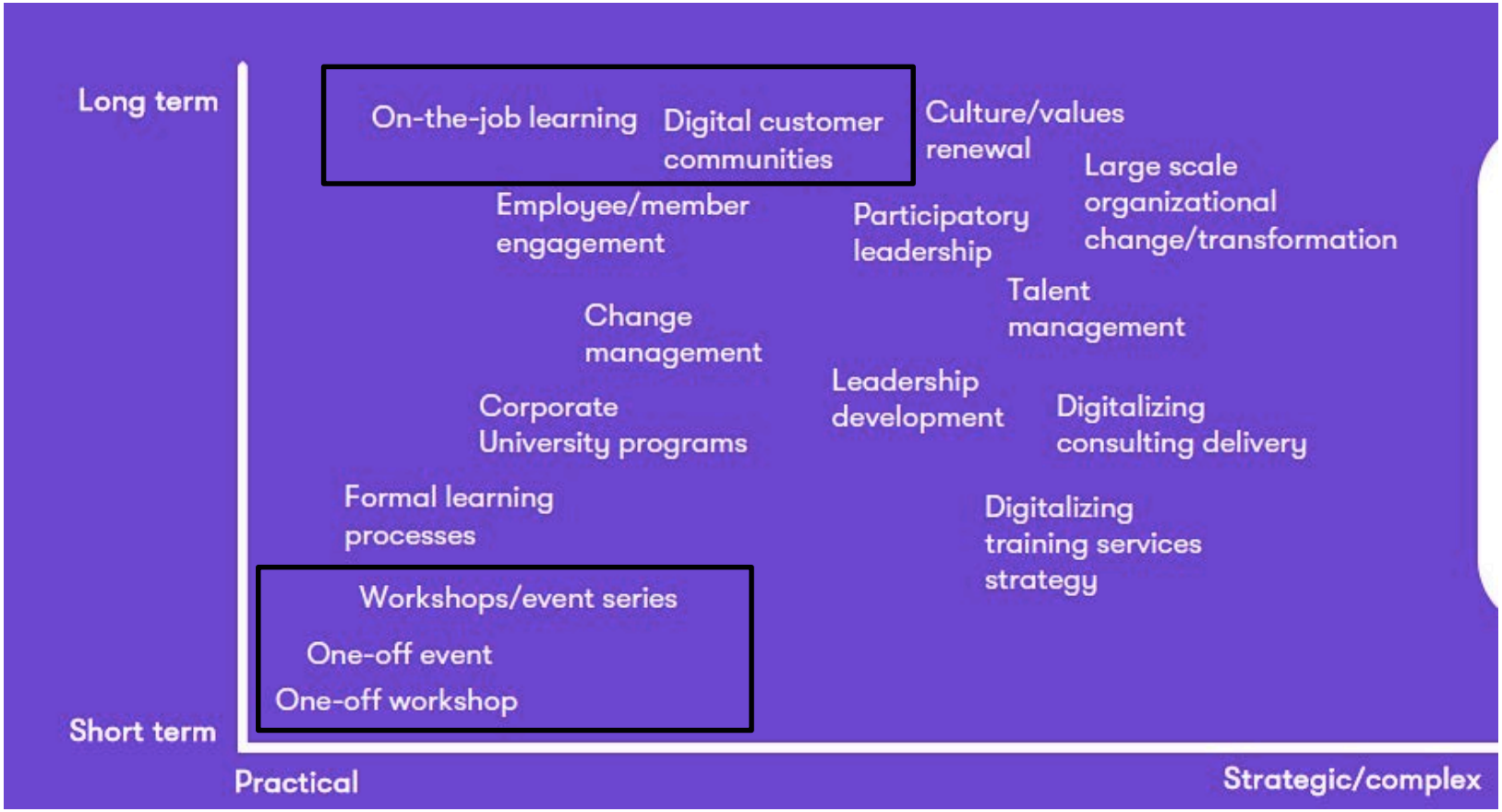
Adapting to the **#NewNormal**

New Digital Facilitation & Engagement Modalities



Adapting to the #NewNormal

- **Incorporate HEAT Trained Support Animators**
  - During 100% Online HERO Homeowner Orientations Workshops
  - Between Workshops to Support Neighborhood Local HEROES Programs
- **Integrate Mobile Learning Experiences**
  - Social Quizzes for Participant Aggregation and Segmentation
  - AI Chatbot for Homeowner Engagement
  - 3D-VR 360 Immersive Experiences & Tours with Assessments
- **Adopt Best in Class Digital Facilitation Tools**
  - Discussions/ Polls (real-time)
  - Pulse (long-term follow-up)
  - Assignments (for coaching, mentoring)
- **Develop Immersive and Accessible VR Content for Workforce Development**
  - Retrofit Simulations
  - VR Go, Quest, Rift Immersive Experiences (e.g. VR Employment / Training Experiences)

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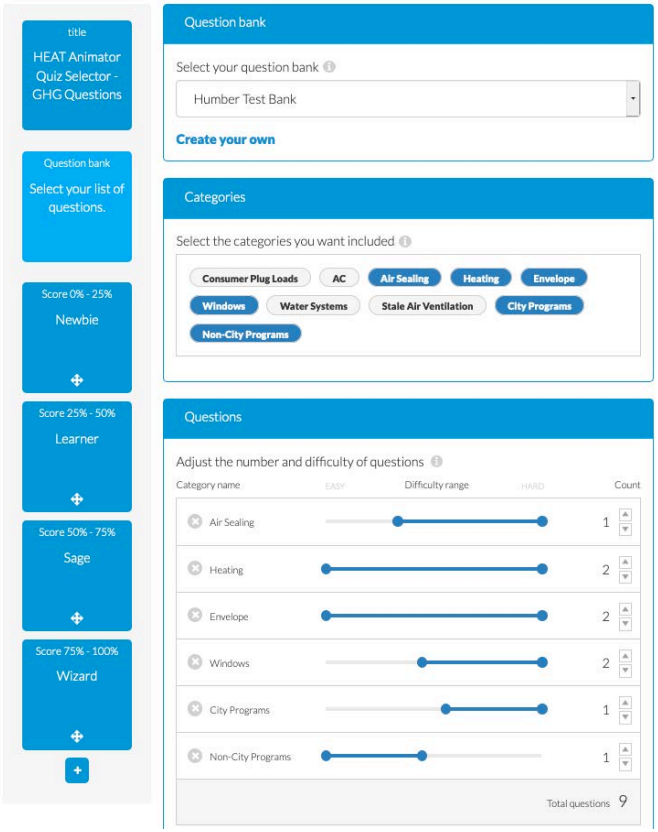
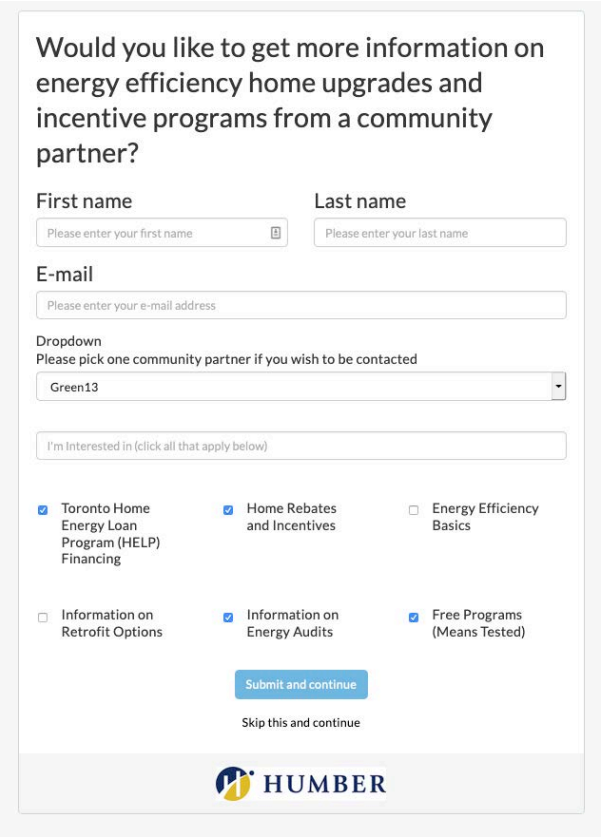
Interactive Mobile Engagement: Sample Topic Curation:



Interactive Mobile Engagement: Sample Community Call to Action



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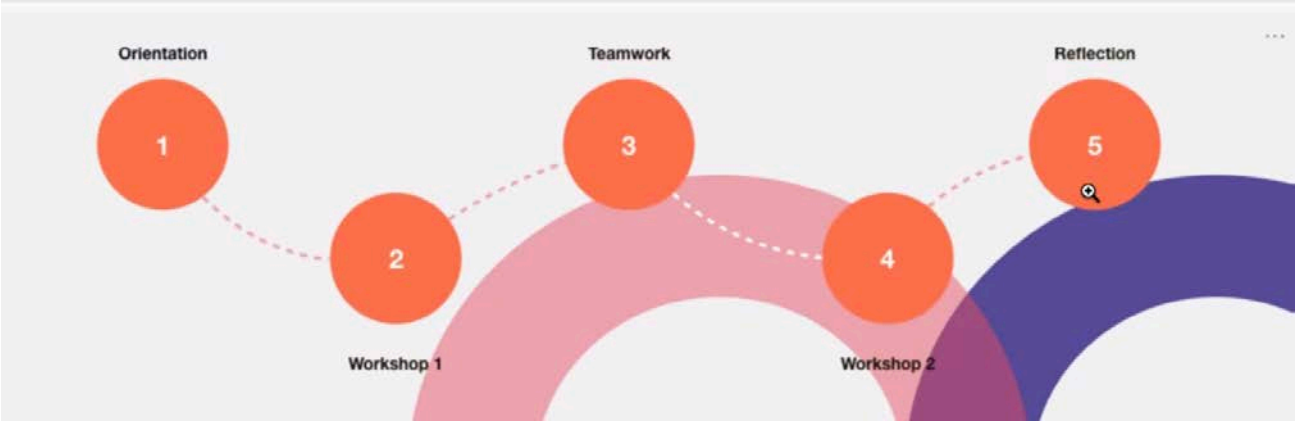
Adapting to the **#NewNormal**

New Digital Facilitation & Engagement Modalities



Sample 100% or Blended Learning Community Engagement RoadMap

Thank You!

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