NORMANDALE COMMUNITY COLLEGE

Shaping the Future of Vacuum Technology Education

WORKSHOP #1: TECHNICAL PROGRAM PERSPECTIVE

SEPTEMBER 24, 2020

This work was made possible in part by a grant from the **National Science Foundation** (ATE DUE #1700624)

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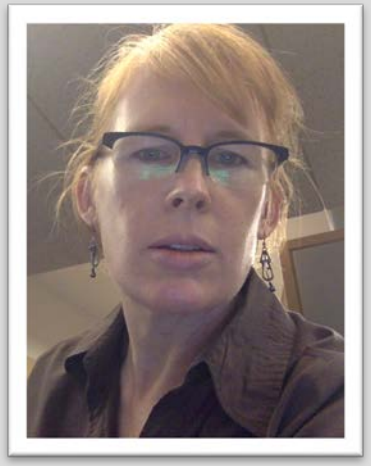
Workshop Organizers

Nancy Louwagie
Principal Investigator
DELIVER Project

Bob Bailey
External Evaluator
DELIVER Project
Outcomes Consulting Services



Sarah Holsted
Communications Specialist
DELIVER Project

With gratitude for the support of the administration of Normandale Community College and the DELIVER Project team.

Cary Komoto, Dean
Science, Technology, Engineering, Math and Education Division

Tom Johnson, Co-PI
Dr. Ruth Robinson, Co-PI
John Lasswell, Instructor
Dr. Angela Foudray, Instructor
Rand Whillock, Instructor
Steve Osell, Lab Assistant
Cindy Zoul, Project Manager
Tim Lapanne, Student Services

Normandale DELIVER Project Team

Nancy Louwagie
Program Chair
Intro to Vacuum Tech

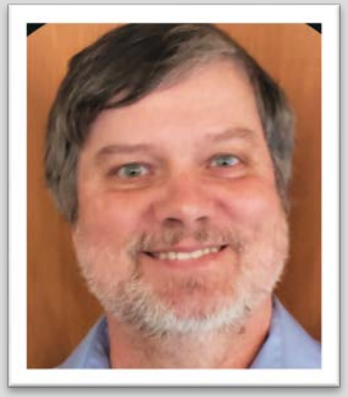
Dr. Ruth Robinson
CHEM faculty,
VACT instructor,
co-PI, DELIVER

Tom Johnson
VACT instructor,
co-PI, DELIVER

Dr. Angela Foudry
PHYS and ENGR instructor,
VACT instructor,
Sr Personnel, DELIVER

John Lasswell
VACT Instructor,
Sr Personnel,
DELIVER

Steve Osell
VACT Lab Assistant



Rand Whillock
VACT automation instructor,
Sr Personnel,
DELIVER

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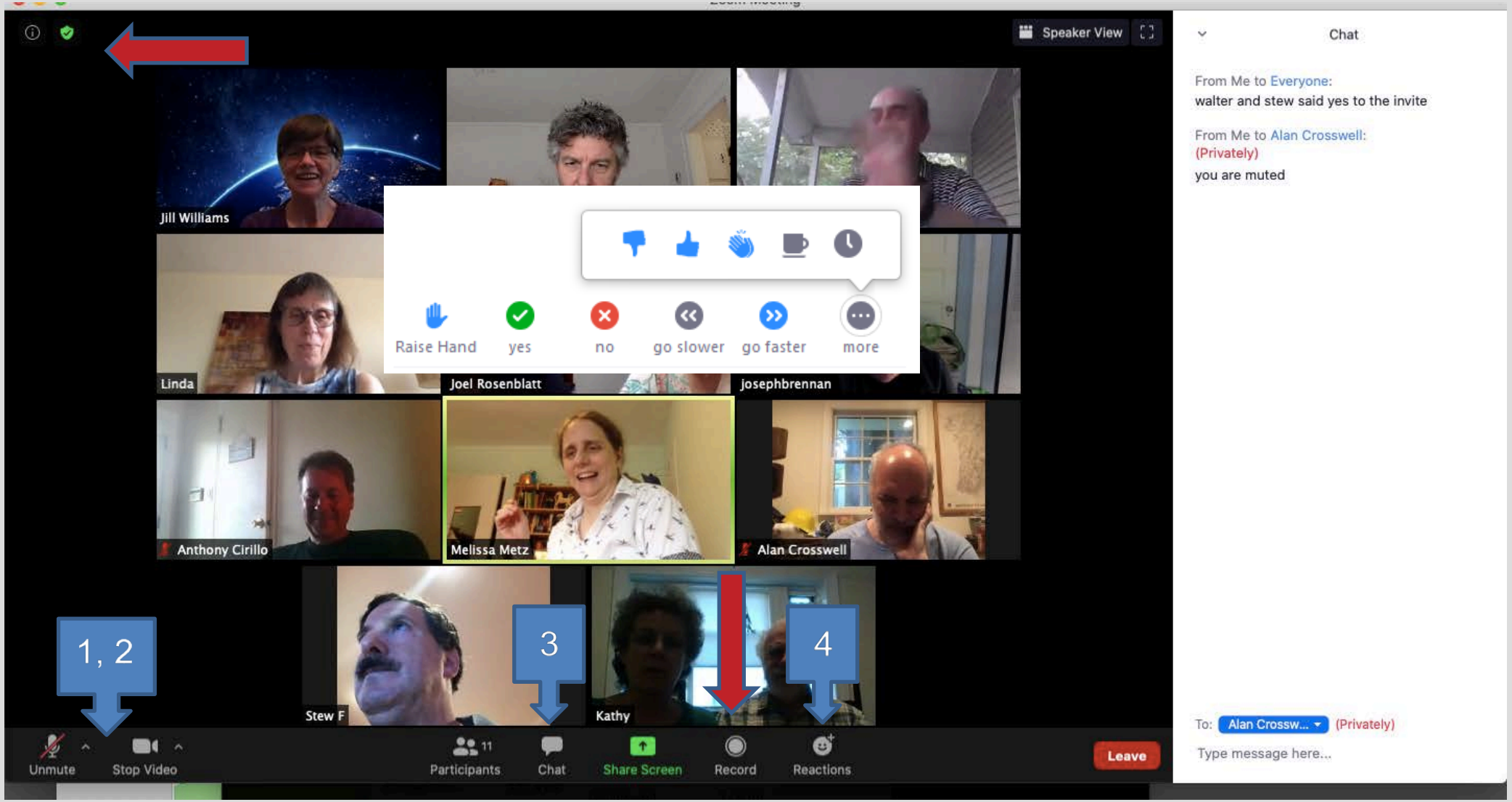
Orientation



Control features

1) Mute
2) Camera
3) Chat
4) Raise Hand-> Reactions

Process

- Summary in chat box
- Raise hand and / or chat
- Q&A breaks

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Shaping the Future of Vacuum Technology Education

WORKSHOP #1: TECHNICAL PROGRAM PERSPECTIVE

Introduction: About the Workshop Series

SEPTEMBER 24, 2020

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Workshop Series Agenda and Objectives

Past

- Provide history and context
- REVAMP and DELIVER Projects at Normandale
  - Results
  - Impact

Present

- Map the current state of vacuum technology in the U.S.
  - Identification of gaps
  - Industry perspective
  - Student perspective
  - Demonstrations of current practice

Future

- Plan for growing and sustaining the program
  - Identification of opportunities and needs
  - Identification of sectors
  - Brainstorm

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Shaping the Future of Vacuum Technology
2020-2021 Workshop Series

Session 1 Technical Program Perspective	Session 2 Professional Society Perspective	Session 3 Industry and R&D Perspective	Session 4 Student Perspective	Session 5 Summary of Key Findings Final Report

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Independent Assignments

Assignment 1

Gap Analysis

- Identify gaps as opportunities for growth

Assignment 2

Impact Analysis

- Impact of past activities and desired impact for future activities

Assignment 3

Brainstorming

- Use collective experience of this group to identify potential strategies and opportunities

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Workshop Series Timeline

Session 1	• September 24
Assignment 1 – Gap Analysis	• Due back October 8 - 2 weeks after session 1
Session 2	• Oct 19 – Oct 30
Assignment 2 – Impact Analysis	• Due back 2 weeks after session 2
Session 3	• Nov 9 – Nov 20
Assignment 3 - Survey	• Due 2 weeks after session 3
Session 4	• Jan 19 – Jan 29, 2021
Prep for Session 5	• 1 week prior to session 5
Session 5	• March 1-5 or March 15-19, 2021
Final Report	• Early April 2021

Series Deliverables

https://www.normandale.edu/departments/stem-and-education/vacuum-and-thin-film-technology/shaping-the-future-of-vacuum-technology-education


Participant List

Slides

Recording

Final Report

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Q&A Break

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Shaping the Future of Vacuum Technology Education

WORKSHOP #1:
TECHNICAL PROGRAM PERSPECTIVE

Normandale's Vac Tech Program and NSF Projects

SEPTEMBER 24, 2020

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Vac Tech Program History

1996

- Normandale Community College begins to offer credentialing in vacuum technology

2014

- National Science Foundation (Project ReVAMP, NSF DUE #1400408)

2017

- Project DELIVER (NSF DUE #1700624)

2020-2021

- Workshop series designed to examine vacuum technology education in the U.S. and to develop a framework for the future

Growth and Sustainability

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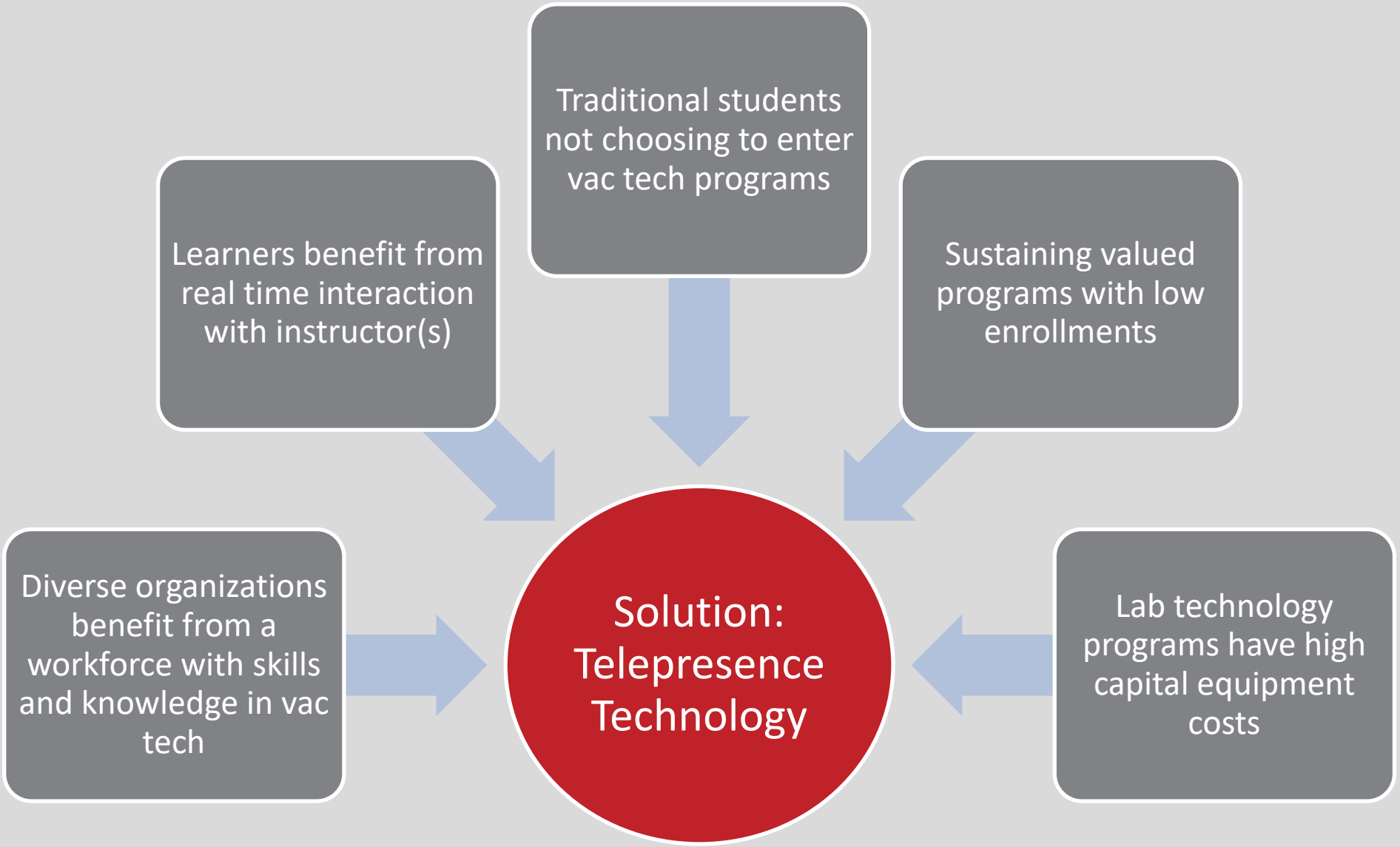
Motivating Rationale



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Revising Vacuum Technology – an Advanced Manufacturing Program (REVAMP) NSF DUE #1400408

Revise curriculum	Design and build trainer system for hands-on learning	Deliver courses via telepresence
Expanded use of LMS Delivered 7 VACT class sections via telepresence	Built 4 HVETs and 3 RVETs Shipped VETs to partner sites	Engaged 4 industry partners, 1 academic partner and 1 national lab as partner sites

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Distance Education and Learning in Vacuum Technology for Employment (DELIVER) NSF DUE #1700624

Expand pathways through easy access

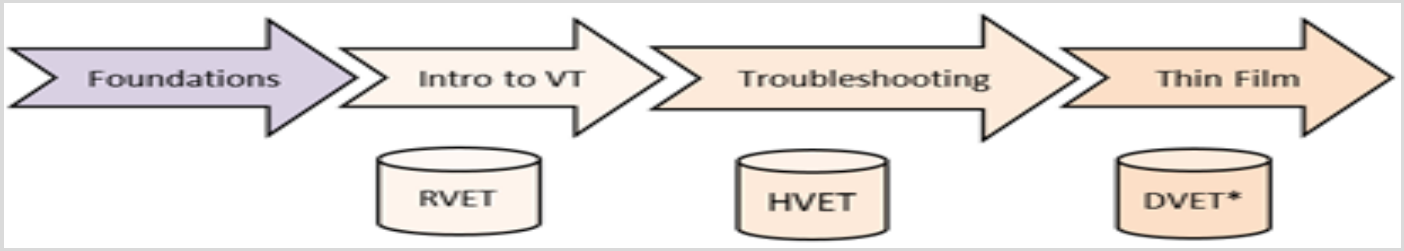
- Asynchronous foundations course
- Expanded telepresence to capstone courses

"Focused track" credential

- VACT certificate

Increase pool of instructors

- Instructor guide VACT 1292
- Semester long class observation, teaching partnership
- Industry partners



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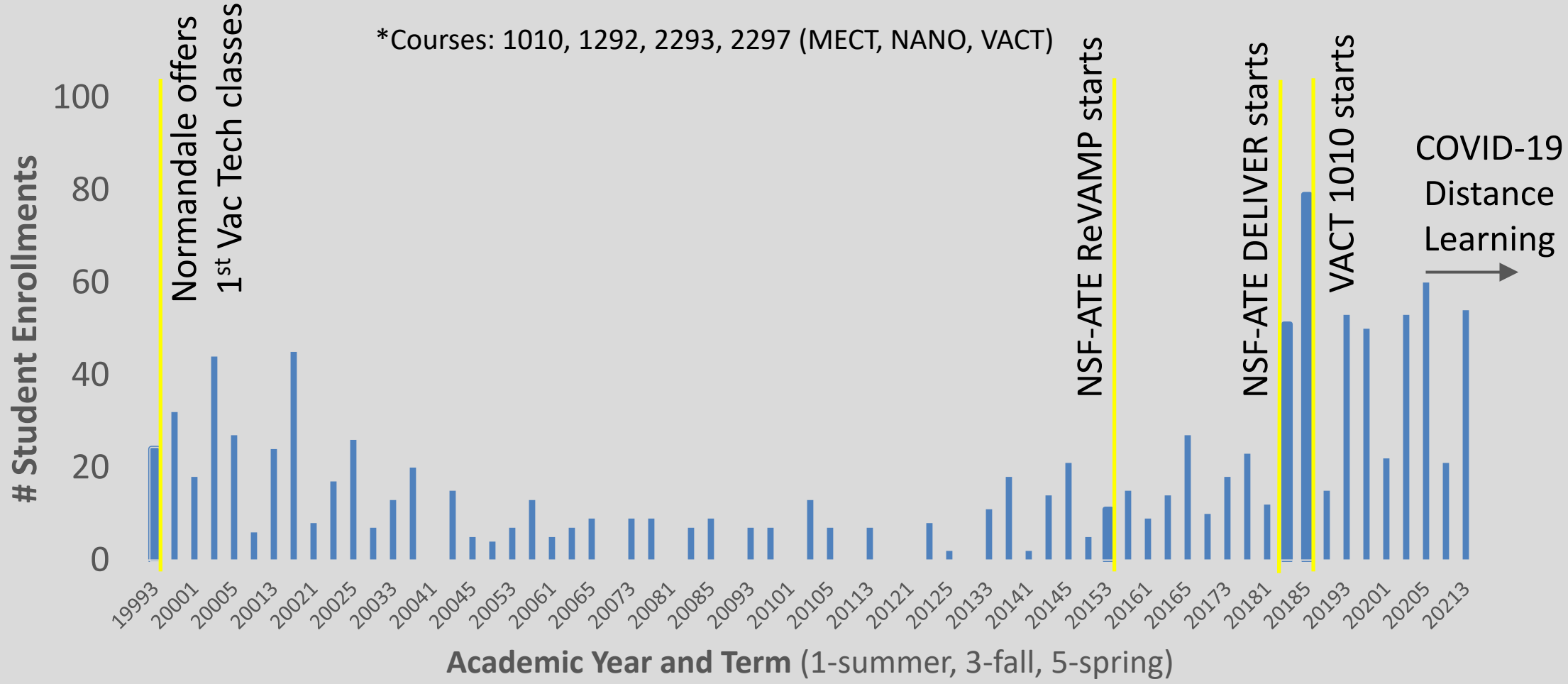
Enrollment in ALL Normandale Vac Tech Courses*

Fall 1998 – Fall 2021

*Courses: 1010, 1292, 2293, 2297 (MECT, NANO, VACT)



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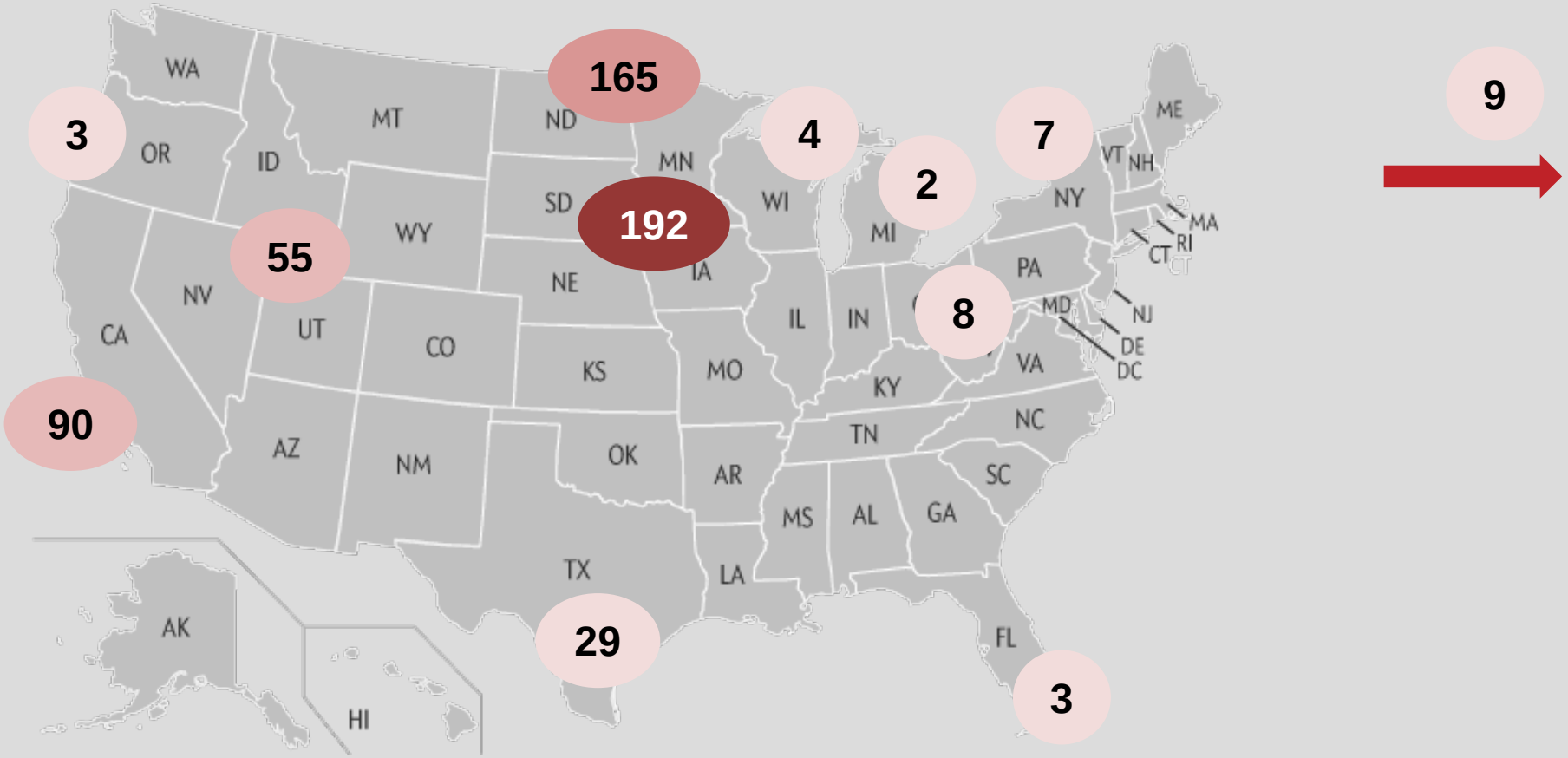
Reach of Vac Tech Program since 2014

State	# Enrolled
MI	2
FL	3
OR	3
WI	4
NY	7
PA	8
NI	9
TX	29
UT	55
CA	90
MN	165
Traditional Student / Unknown Affiliation	192



Partners: Industry, Academic, Professional Society

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Q&A Break

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Shaping the Future of Vacuum Technology Education

WORKSHOP #1: TECHNICAL PROGRAM PERSPECTIVE

Introduction to Gap Analysis

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Gap Analysis Assignment

Growth and Sustainability of Vacuum Technology Programs

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Gap Analysis Worksheet

Respondent (Name and Organization):
Date:

Question	Response	Other notes or comments
What sector do you represent?	☐Coatings ☐Advanced manufacturing ☐R&D ☐Education and training ☐Other - describe in notes/comments	
Describe your organization briefly – products and services, size,		
Describe the role and importance of vacuum technology to your sector		

Gap or Opportunity	**Rationale**	**Outcomes**
List and describe what is missing from • existing knowledge (e.g. curriculum content' technical topics, skills) • infrastructure (e.g. labs, equipment, networks) • Other resources • activities and programs for education and training in vacuum technology (e.g. telepresence; recruitment, credentials) • geographic or sector specifics • Opportunities (unmet markets, emerging markets, partnerships)	Provide the reasoning for why is it important to address this gap.	List the expected results of the actions taken. How will we know that the action is effective in addressing the gap?

Example

Question	Response	Other notes or comments
What sector do you represent?	☐Coatings ☐Advanced manufacturing ☐R&D ☒Education and training ☐Other - describe in notes/comment	
Describe your organization briefly – products and services, size,	Normandale Community College offers a number of credentials in vacuum technology including an Associates of Applied Science (AAS) two-year degree (60 credits) and a Vacuum Technology Certificate (9 credits). VACT courses are offered in the following modes: in-person, on-line asynchronous, and on-line synchronous in telepresence. One VACT course is a fully on-line experience. Three VACT courses incorporate the use of vacuum equipment trainer systems to support hands-on activities.	
Describe the role and importance of vacuum technology to your sector	Normandale is the only higher ed institution in the U.S. that offers credentials in Vacuum and Thin Film Technology (AAS degree and Certificates). This is largely shaped by the industry in the region. The Vacuum and Thin Film Technology program works with the local companies that use this technology to put together a curriculum that emphasizes the relevant skills to excel in the field.	

Example

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Gap or Opportunity	Rationale for addressing	Outcomes
Perception of community colleges are second or third options for post-high school education. Often perceived as transfer school and not as a credential awarding institutions leading to employment opportunities	Community colleges are an underutilized resource for meeting workforce needs	Increased enrollments, more completers, more workforce placements
Community colleges are still learning how to embrace and deploy distributed learning technologies – these technologies have limited resources in CC budgets	Classes utilizing video conferencing have been rapidly mainstreamed. Telepresence is an emerging technology platform in education, especially in a COVID environment	Realize increased enrollments in telepresence classes

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Breakout Session and Q&A Break

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Workshop Timeline

Workshop	• September 24
End of Workshop Survey	• https://www.surveymonkey.com/r/655ZTDT
Participant Support Request / Worksheets Due	• October 8
Results Compiled	• October 15
Initial Report and Next Workshop	• October 19 - 31

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Shaping the Future of Vacuum Technology Education

WORKSHOP #1: TECHNICAL PROGRAM PERSPECTIVE

Demo: Tour of *Anywhere-Technical-Education*

SEPTEMBER 24, 2020

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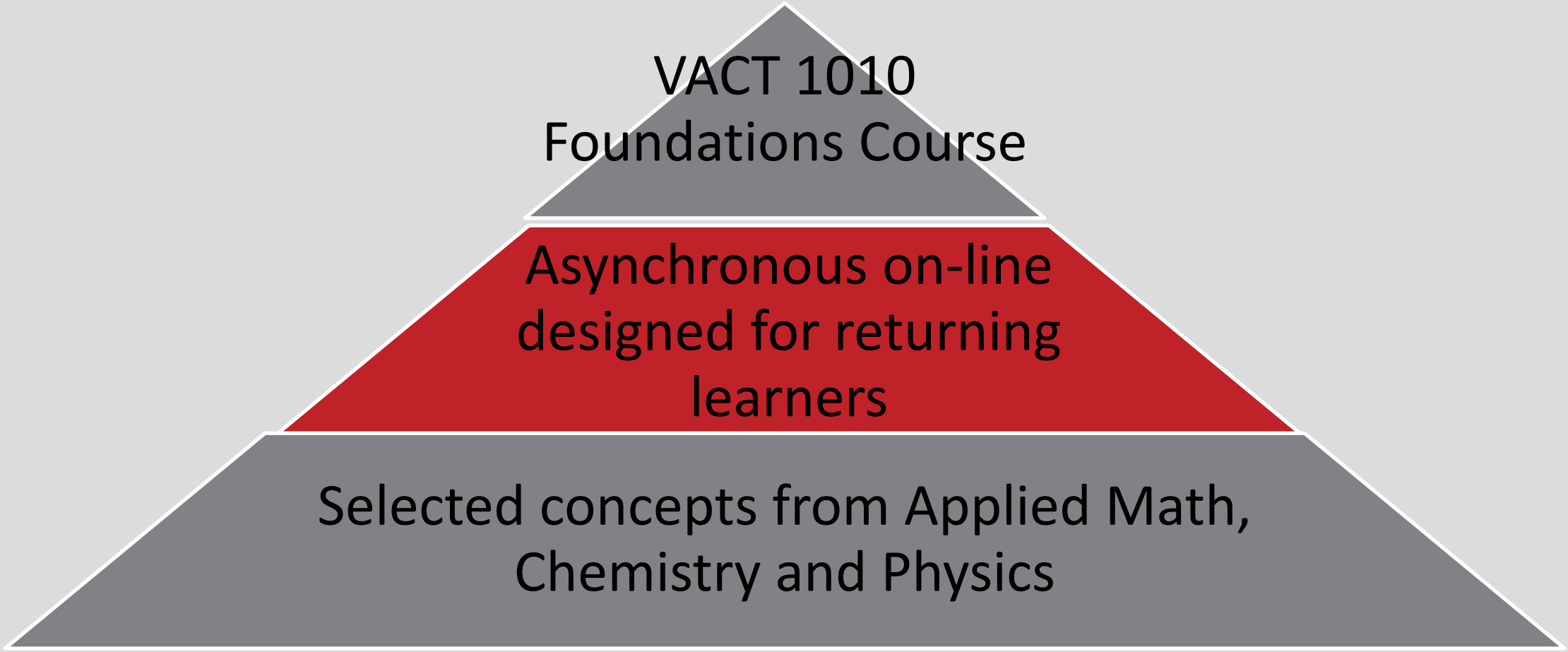
On-Ramp to Vacuum Certificate



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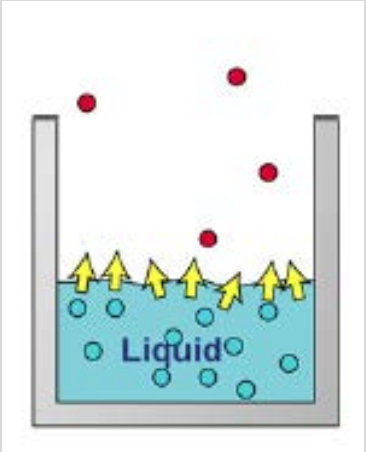
Course Content – Foundations in Vacuum Science

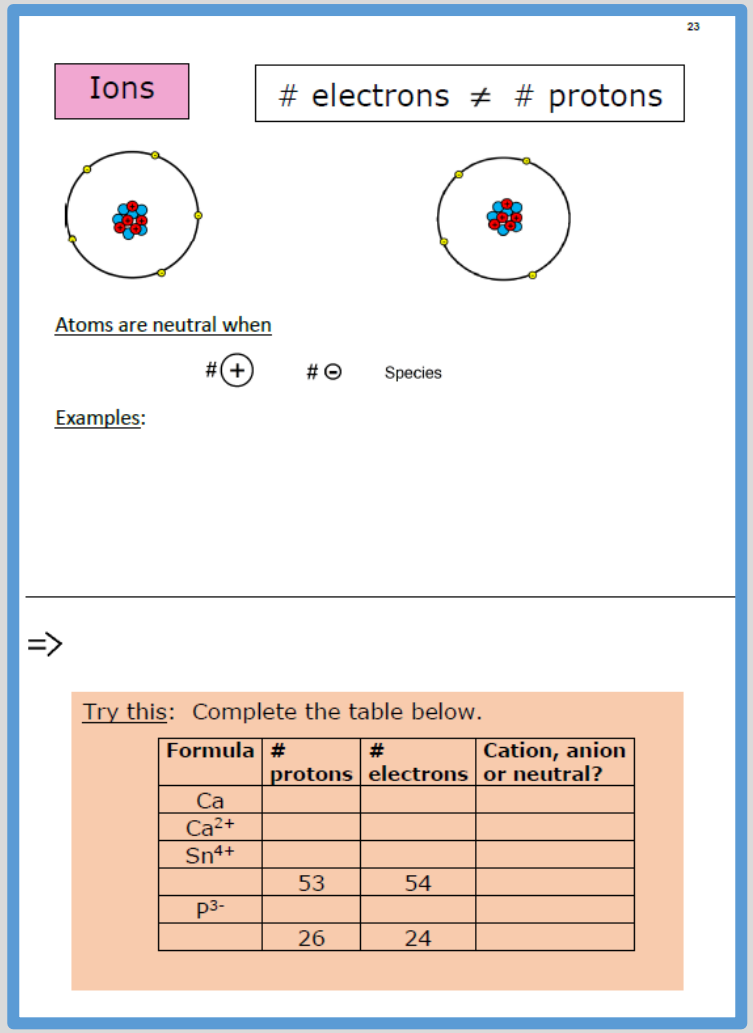
- Module 1: Matter & the Periodic Table
- Module 2: Compound names, units & converting numbers
- Module 3: Moles, mass, particles, & the Kinetic Molecular Theory of Gases
- Module 4: Pressure, temperature, density, significant digits & vacuums
- Module 5: Gas laws & basic graphing
- Module 6: Heat transfer, logarithms & Excel graphs
- Module 7: Intermolecular forces, vapor pressure & surfaces
- Module 8: Chemical safety, acids/bases & simple electric circuits



Course Element: Video Lessons

- Colorful backbone notes
- Guided note-taking

https://mediaspace.minnstate.edu/media/Ions/0_05jw3ktp



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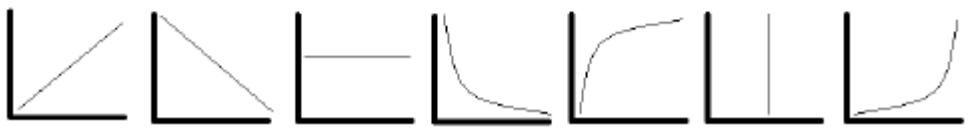
Course Element: "Try This" Practice

Try this: Match each data set to the correct form of graph.

Graph 1	
X	Y
1	1
2	8
3	27
4	64
5	125

Graph 2	
X	Y
4	17
8	29
12	41
16	53
20	65

Graph 3	
X	Y
1	30
2	15
3	10
4	7.5
5	6



Try this: Put the numbers below in order of increasing size.

4×10^{-3} 6×10^{14} .0041 800 1.0

7.3×10^{2} 2.2×10^{14} 9×10^{-2}

Try this: Cl_2 H_2O N_2

A) Which of the three molecules above is most likely to stick to the walls of a vacuum chamber?

B) Which is the least likely?

Try this: The pressure in a vacuum chamber has been pumped down to 1.0 Pa. What value would be displayed on a pressure gauge that reads in torr?

Try this: Circle all the factors below that affect the vapor pressure of a substance.

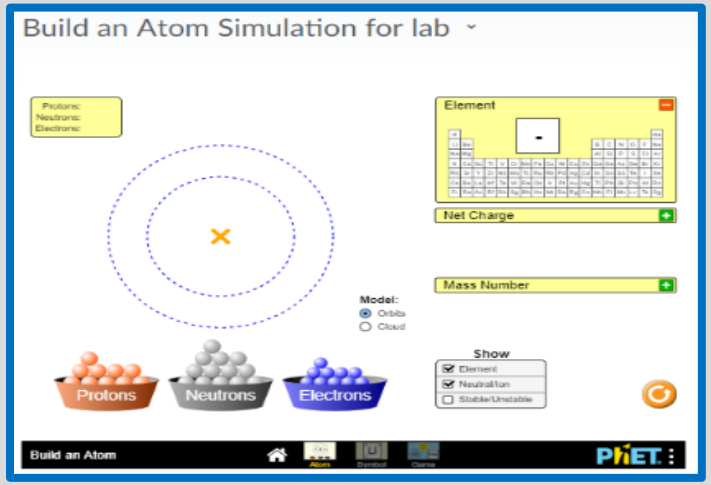
volume of container volume of substance

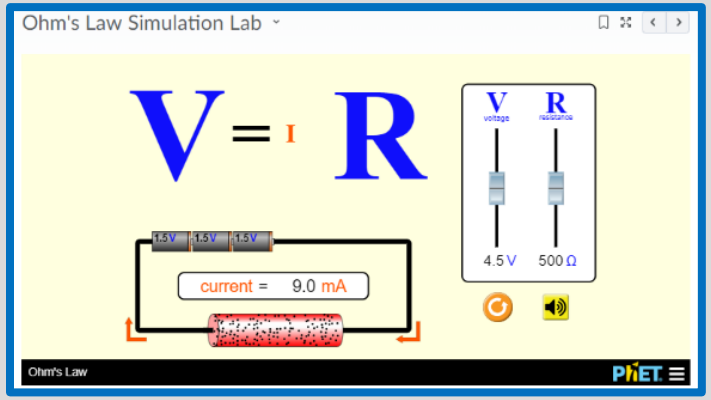
Pressure temperature

identity of substance surface area

Course Element: Activities

- Activities- 2 times each module
- Longer, more in-depth practice and application
  - –Worksheets
  - –Case studies
  - –Simulations, https://normandale.learn.minnstate.edu/d2l/le/content/5094464/viewContent/44537142/View





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Tour of *Anywhere-Technical-Education Classroom* @ Normandale

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Q&A Break

Post Workshop

- Look for an e-mail from Normandale that provides
  - Link to evaluation survey for workshop
    - https://www.surveymonkey.com/r/655ZTDT
  - Instructions for application for stipend
  - Gap analysis worksheet – due back by October 8
  - Link to workshop site on Normandale's page
  - Request for participant bio for list

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Shaping the Future of Vacuum Technology Education

WORKSHOP #2:
PROFESSIONAL SOCIETY PERSPECTIVE

THANK YOU!!!

DATE TBD OCT 19-30 , 2020

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