NORTH SHORE
WIB
WORKFORCE INVESTMENT BOARD

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Agenda
Skills Committee Meeting

July 18th 2017, 9:00AM   70 Washington Street, WIB Conference Room

Membership: Art Bowes; Tony Dunn; Laurie Roberto; Thelma Williams; Teury Merte; Laura Rubin; Nastaha Soolkin; Edward Terrill; Amanda Warnock; Gina Frey; Laura MacNeil; Bonnie Carr, Jacqueline Smith; Mary Zwiercan; Tracey Cahalane; Christy Sugarman

I. Introductions
II. Tasks and Objectives of the Skills Committee 2017:
  - Continue LMI training and information sessions with ABE providers and other workforce training vendors
  - Investigate the possibility of at least one non-credit program being offered to career center customers having credit offered as an outcome to begin educational pathway
  - Documented cases (examples) of transferable credits/work experience credit to be share with post-secondary education partners.
  - Continue to document cases on new programming happening in the region that is innovative and meets the needs of employers
  - Share new tools in forums held at the career center for staff of partners on the various tools available.
  - Survey of educators on ideas of potential career pathways models that can be replicated in our area.
III. Future of Work - *June 22, 2017 Event and Next Steps*
IV. Regional Planning Activity – *future activities and data collected*
V. Adult Career Pathways– *updates for FY 2018, 2019 (Both k-12 schools and adult education agencies.) Ideas surrounding NSWIB goals for FY 2018, 2019, and 2020 surrounding getting teachers to see*
VI. Updates from Committee Members

Next Meeting: 10/17/17, 12/19/17, 2/20/18, 4/17,2018, 6/19/2018

4-25-2017

Attendees:

Gina Frey, Mary Zwiercan, Kyle Hawkins for Thelma Williams, - Mary Sarris, Ed O'Sullivan,

SKILLS COMMITTEE GOALS AND OBJECTIVES 2015 - 2017

GOAL 2: THE NORTH SHORE WIB WILL STRATEGICALLY UTILIZE RESOURCES AND FULLY ENGAGE THE BUSINESS SECTOR AND EDUCATORS (BOTH K-12 AND ADULT) TO CLOSE THE SKILLS GAP THAT EXISTS BETWEEN AVAILABLE WORKERS AND EMPLOYERS.

MAJOR THEMES

1. PROVIDE TRAINING FOR EDUCATORS AND OTHER TRAINING STAKEHOLDER ON COMPANY SKILL NEEDS AND OTHER LABOR MARKET INFORMATION.
2. ASSIST EDUCATORS TO UTILIZE NEW AND BETTER WAYS TO HELP ADULT LEARNERS LEARN EFFICIENTLY AND SUCCESSFULLY
3. ADVOCATE FOR THE PROVISION OF CREDIT FOR NON-CREDIT PROGRAMS AND FOR TRANSFERABLE COURSES AND CREDIT FOR LIFE EXPERIENCE
4. TRAIN CAREER CENTER STAFF ON BETTER SERVICE CUSTOMERS IN RELATION TO BOTH LMI AND NEW WAYS TO PROVIDE TRAINING
5. HELP COMPANIES DEVELOP CAREER PATHWAYS AND ANALYZE THEIR SKILL NEEDS IN RELATION TO LEVELS OF EDUCATION AND EXPERIENCE REQUIRED FOR HIRING

Tasks for 2017

A. Continue LMI training and information sessions with ABE providers and other workforce training vendors
B. Investigate the possibility of at least one non-credit program being offered to career center customers having credit offered as an outcome to begin educational pathway
C. Tours of companies set up for ABE providers and their students - proving adult learners with opportunity to see new workplace environment in a critical industry

D. Provide data and analysis on occupations and industries that have left area as well as new occupations developing –shared with educational providers to refine programming
E. Continue to documented cases on new programming happening in the region that is innovative and meets the needs of employers

Objective #1: Collaborate with educational and training partners to increase available resources and align policies so that employer and worker needs are met.

Activity:	**Timeframe:**	**Benchmarks/Indicators of Success**	**Updates**
Strengthen connection between Adult Ed and companies through various means including company tours, seminars, business speakers, etc. in order to help adult education providers teach current skills and better prepare students for successful transition to college and work.	2015 – 2017	- 2 Tours per year of companies for Adult Basic Education providers staff - Establish speaker series for providers to learn about businesses needs and LMI	The committee reviewed the goals and objectives for FY17.
Advocate for innovation in the delivery methodologies of education and training – including more resources for more ESOL funding in higher levels, in particular level IV. • Support fast-track academic remediation programs • Support career pathways/gateway methods for adult education	2015 – 2017	- Documented cases on new programming happening in the region that is innovative and challenging - Survey of educators on ideas of potential career pathways models that can be replicated in our area.	The concept of universal customer service training was discussed by the committee. Customer service training is being incorporated in training programs. For examples, HVAC Students are learning sales training while they learn how to service.

• Support appropriate ways to use technology for adult learners Support workplace education programs			
Build better understanding of credit programs and relationships to non-credit programs for education providers and companies	2015 – 2017	- At least one non-credit program being offered to career center customers having credit offered as an outcome to begin educational pathway.	Christie Sugarman from NSCC presented to the committee the process by which NSCC gives credit for non-credit programming. The transfer of non-credit to credit is an organic process conducted by faculty. Courses may be bundled together to give 3 academic credits or a single non-credit course can be transferred to 3 academic credits on a 1 for 1 basis. Determination is based on course syllabus and faculty judgement. The committee asked about transferring foreign credits. These courses are transferred a case by case basis and involve third party evaluation/translation. Institutions may enter into MOU with the college to facilitate course transfers between both institutions. Course credit can also be given for experimental

Build a better understanding of transferrable credits, and credit for work experience, and how these work and how they can work better for adult learners.	2015 – 2017	- Documented cases (examples) of transferable credits/work experience credit to be share with post-secondary education partners.	learning, volunteer work, and experience. An example was given of a student who is an EMT with 10yrs experience and holds a certificate. This student would receive academic credits for EMS 101 & 102 based on experience & their certificate. Work experience and certificate would both need to be evaluated and documented. During the December 20th meeting Christine continued her presentation to the committee and will share the powerpoint with links to the various online tools that are available.
Develop CommUniverCity fully	2015 – 2017	- Participate in the implementation of this model and provide assistance when needed with regards to the workforce development system	

Training data analyzed with more details on industry clusters on placements and wages – information for Case Managers to share with potential training customers.	2016	- Training data analyzed and shared with Career Center management and staff.	

Objective #2: Facilitate alignment of education, training, workforce and economic development activities so that employer and worker needs are met through LMI and other research-based facts and data

Activity:	Timeframe:	Benchmarks/Indicators of Success	Status
Series of Seminars cover LMI related topics given to vendors and CBO's, including basic LMI presentation, backed up by company presentations. Provide data and analysis on occupations and industries that have left area as well as new occupations developing –shared with educational providers to refine programming	2015 – 2017 2016	- Establish speaker series for providers to learn about businesses needs and LMI - Training data analyzed and shared with adult ed. Providers and other CBO's	
Improve vendor and CBO understanding and use of Technology related resources to help customers gain skills needed to succeed in the workplace. These include National Career Readiness, TORQ , HWOL, and Interview Stream. Promote these products with employers as well	2016 2016	- Share study of On-line learning (held across SSU, NSCC and Endicott) with educational providers and CBO's in the region. - Share new tools in forums held at the career center for staff of Adult education providers and	

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		CBO's on the various tools available.	
Develop skills of Career Center staff to assist customers on using a variety of learning methods that work best for adult learners, including career pathways, online learning, fast track, etc.	2015 – 2017	- Have a dedicated staff person to assist customers with Microsoft office products and share tips on how to do this with staff (4 brown bags info sessions per year)	

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The Future of Work on the North Shore – a collaborative opinion survey and planning effort for the North Shore.

Report in progress – Powerpoint of all survey responses at:

http://northshorewib.com/fow/ or http://northshorealliance.org/

Who Responded?

Elected Officials – 18	Social Service/Community Leaders – 134
Businesses – 504	Housing experts – 12
Students – 512	Job Seekers – 416
Economic Development Professionals – 23	Total - 1668
Educators - 82	

What did we learn?

Overall –

1. Ability and Willingness to be a constant learner will be the number one skill for the future
2. Technology skills will be a must.
3. Various types of communication skills, written and oral, face-to-face and remotely, will be critical.
4. Respect for diverse customers and colleagues also will be critical.

Emerging Workforce –

1. Is not interested and/or is not aware of critical careers on the North Shore
2. Has different priorities and modes of operating
3. Wants fulfillment in a career on their own terms.

Sample Responses:

Business:

Future Skill Sets Needed	Changes your company/industry anticipates
Ability/Willingness to Learn – 80%	New Jobs Created – 54%
Technology Fluency – 72%	Fewer Jobs Needed – 7%
Work with Diverse Colleagues – 48%	Different business models – 50%
Better Math Skills – 30%	Greater Efficiencies from Technology – 46$
Speak a foreign language – 30%	

Students:

On a scale of 1 to 5 with 5 being highly likely, how Likely are you to pursue employment in the following?	
Health Care – 3	Retail – 2.4
Construction – 2.2	Education – 2.6
Financial Service – 2.4	Administration – 2.8
Manufacturing – 2.3	Arts and Entertainment – 2.5
Food Service – 2.2	Professional and Technical Services – 3.1

THE FUTURE OF WORK ON THE NORTH SHORE – JUNE 22, 2017

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18 month project to research and listen to stakeholders across the North Shore about their thoughts and ideas on the Future of Work. Ultimately, this study is based on three primary questions:

- *What does the Future of Work on the North Shore look like?*
- *Are we ready for it?*
- *How can the region effectively prepare for what's ahead?*

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Supply Side Data – North Shore Region

	Oct 2007	Jan 2010	April 2017
	Date of lowest unemployment rate pre-recession	Height of the recession	Most recent month available
Unemployment Rate	3.80%	9.20%	3.6%
Number of employed residents	206,137	195,871	231,840
Number of Unemployed	8,135	17,448	8,369

- *We have recovered from the recession and then some*

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North Shore Supply by Age

Total Labor Force Over 16 yrs.	North Shore	Mass.	New England	U. S.
	342,130	5,479,502	11,955,631	251,221,309
16 to 19 years	6.5%	7.0%	6.9%	6.8%
20 to 24 years	8.3%	8.9%	8.5%	9.0%
25 to 44 years	30.0%	32.1%	30.8%	33.3%
45 to 54 years	19.1%	18.2%	18.6%	17.5%
55 to 64 years	15.3%	15.9%	16.6%	15.7%
65 to 74 years	10.9%	9.8%	10.2%	10.0%
75 years and over	10.0%	8.2%	8.4%	7.8%

U.S Census Bureau, 2011-2015 American Community Survey, www.census.gov

- *Our workforce is "older" – we need to pay attention to the needs of mature workers.*
- *Our youth are very important to our future*

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North Shore Supply by Education

Population 25 yrs. and over	North Shore	Massachusetts	United States
Less than a High School Graduate	9.6%	10.2%	13.4%
High School Diploma (includes equivalency)	26.9%	25.4%	27.8%
Some College or Associate's Degree	25.9%	23.9%	29.1%
Bachelor's Degree or Higher	37.6%	40.5%	29.8%
Percent High School Graduate or Higher	94.1%	89.8%	86.7%

U.S Census Bureau, 2011-2015 American Community Survey, www.census.gov

- ***The North Shore and Massachusetts labor supply is highly educated when compared to the US, but not all jobs require a college level education.***

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North Shore Supply by Age by Gender, Nativity Status and Race-Ethnicity

	North Shore	Mass.	New England
Total	419,939	6,705,586	14,727,584
Gender			
Male	47.7%	48.5%	48.7%
Female	52.3%	51.5%	51.3%
Nativity Status			
U.S. Born	83.7%	83.8%	85.1%
Foreign Born	16.3%	16.1%	14.9%
Foreign Born entered since 2010	19.5%	19.7%	18.7%
Race-Ethnicity			
White, non-Hispanic	78.3%	74.3%	77.2%
Black, non-Hispanic	4.0%	6.5%	6.%
Hispanic	12.2%	10.6%	9.9%
Other, non-Hispanic	2.1%	2.6%	2.5%

U.S Census Bureau, 2015 American Community Survey, www.census.gov

While small in percent, foreign-born populations often require workforce preparation.

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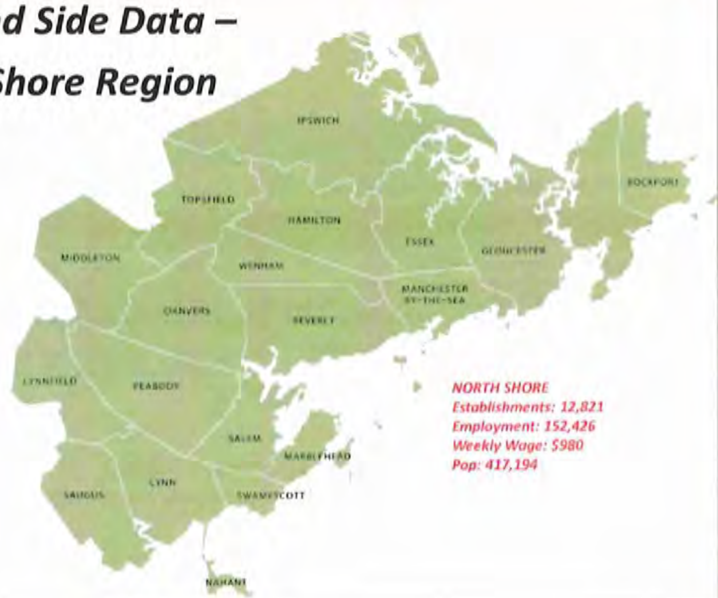
Demand Side Data – North Shore Region



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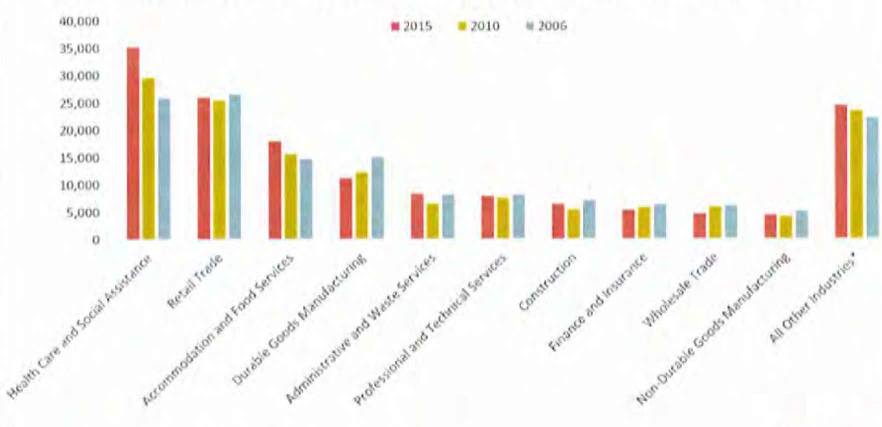
Top 10 Industries of Private Sector Employment on the North Shore



- *Total Employment in 2015 was 152,426*

**Other Services, Information, Arts, Entertainment, and Recreation, Education Services, Transportation and Warehousing, Real Estate and Rental and Leasing, Management of Companies and Enterprises, Utilities, Agriculture, Forestry Fishing, & Hunting, Mining*

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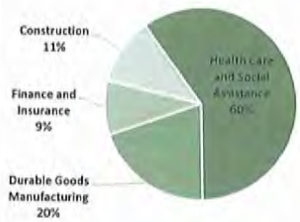
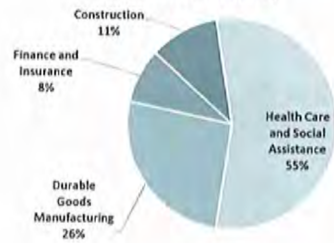
Critical Industry Employment

North Shore



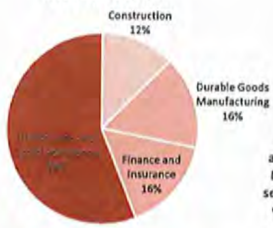
The critical industries account for 38.3% of the North Shore's private sector employment with a workforce of 58,366.

Essex County



The critical industries account for 40.7% of Essex County's private sector employment with a workforce of 113,266.

Massachusetts



The critical industries account for 35.2% of the Massachusetts's private sector employment with a workforce of 1,066,022.

Critical Industries present across our region.

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Top North Shore Online Critical Occupations Job Postings from the past year

Occupation	# of Job Postings	Prior Year
Registered Nurses	560	-4.60%
Social and Human Service Assistants	267	+10.79%
Industrial Engineers	222	-29.75%
Mental Health and Substance Abuse Social Workers	165	-7.30%
Medical and Health Services Managers	103	-1.90%
First-Line Supervisors of Production and Operating Workers	102	-12.07%
Medical Assistants	102	+5.15%
Nursing Assistants	97	-3.00%
First-Line Supervisors of Office and Administrative Support Workers	95	+15.85%
Medical Secretaries	91	-39.33%
Tellers	83	-55.14%
Securities, Commodities, and Financial Services Sales Agents	82	-12.77%
Customer Service Representatives	81	-37.69%
Electrical and Electronic Equipment Assemblers	77	+175.00%
Marketing Managers	72	-4.00%
Total Top 15	2,199	
Total Online Postings	4,955	

- *Top 15 Occupations account for 44.4% of all online postings*

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THE FUTURE OF WORK SURVEY!

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WHO WE HEARD FROM -

	Response(s)
Elected Official or City/Town Manager	18
Business	504
Student (K-12, Post-Secondary and Adult Learner)	512
Veteran	24
Economic Development Professional	23
Educational Leader	82
Social Service and Community Leader	134
Housing Expert	12
Job Seeker	416
Total	1668

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WHAT WE HEARD WHILE LISTENING -

"Transportation continues to be the biggest barrier to employment I see.."

"Companies do not have the skilled labor they need..."

"Health care is ever evolving"

"Ability to think creatively..."

"Technology may eliminate some jobs....it will also create new positions that focus on special job duties"

"Technology fluency is key to acquiring a new job as well as keeping it..."

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Demand Side Responses – North Shore Businesses

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WHAT DO YOU THINK?

What are the future skill sets your business/industry needs? Please choose all that apply

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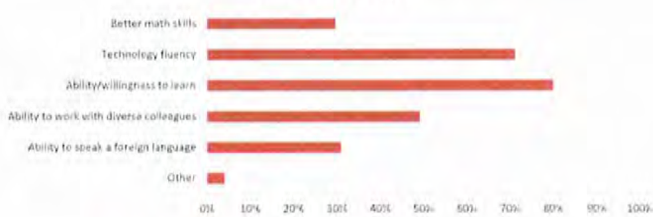
WHAT DID BUSINESS TELL US -

What are the future skill sets your business/industry needs? Please choose all that apply



Survey Comments

- ***Willingness to keep learning...***
- ***Ability to think creatively***
- ***Improvement in customer service and interpersonal skills (e.g. talking on the phone)***
- ***Professional presentation skills and improved writing skills***

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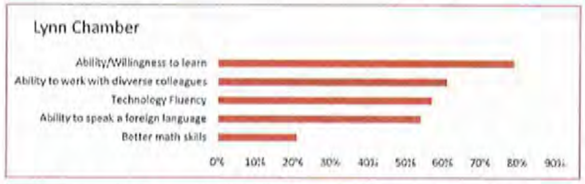
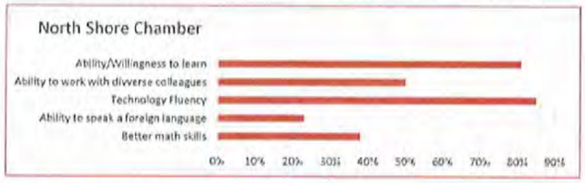
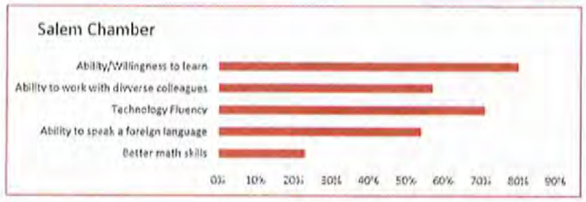
RESULTS from Chamber Surveys - What are the future skill sets your business/ industry needs? (Same survey – distributed via chambers mailing list)







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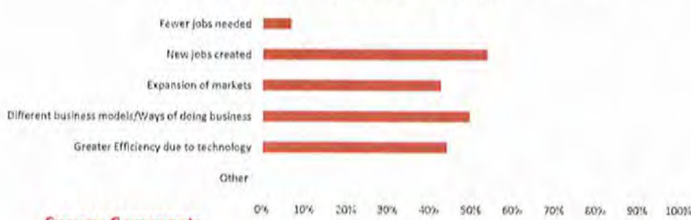
WHAT DID BUSINESS TELL US -

What changes does your company/industry anticipate over the next several years? Please choose all that apply.



Survey Comments

- *While technology increases may be eliminating some jobs/positions...it will also create new positions that focus on special job duties*
- *The high cost of unskilled labor and benefits in MA will lead us to invest in equipment to reduce labor required to do unskilled or minimum wage jobs.*
- *We plan on expanding our international footprint which will lead to new jobs being created.*
- *Replacement jobs for retiring workers*

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WHAT DID BUSINESS TELL US -

If new jobs will be created, what will these new jobs be called?

- *-Universal Banker*
- *-Social Media Manager*
- *-Network Security Technician*
- *-Customer Experience Analyst*
- *-IT Developer*
- *-Digital Marketing*
- *-Autism Specialist*

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WHAT DID BUSINESS TELL US -

What current jobs will increase in demand?

- *-Machinists*
- *-Engineers/Programmers*
- *-CAD Technicians*
- *-Plumbers, Electricians and HVAC*
- *-Nurses*
- *-CDL Drivers*

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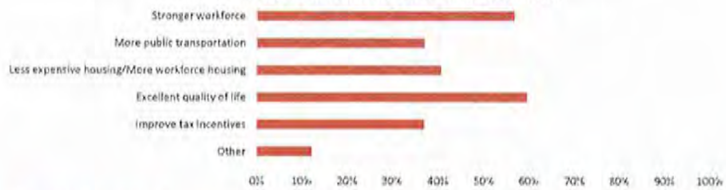
WHAT DID BUSINESS TELL US -

What will make a community more attractive and competitive for your business/industry sector? Please choose all that apply.



Survey Comments

- ***Better qualified workforce. We're in the manufacturing industry and it is difficult to find qualified employees.***
- ***Noted that in Lynn a bus route on weekends has had some considerable cuts with less travel.***
- ***Better public transportation would be a great advantage as many people do not have a car.***

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WHAT BUSINESS LEADERS TELL US IN FOCUS GROUPS – AIM

- ***People working longer (past previous retirement age), resulting in less openings***
- ***"No job now is truly unskilled" – while not every job is highly-skilled, nowadays every job requires some level of basic math skills, basic computer skills, and/or basic social skills***
- ***Meeting compliance and regulation requirements is a challenge***

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WHAT BUSINESS LEADERS TELL US IN FOCUS GROUPS – Tourism Group

- *Technology could have great benefits for tourism, from great use of ride-sharing apps to reduce commuting for both employees and tourists, easy to market online interface*
- *Tendency of industry is to hire part-time, temporary contractors, this allows for a large pool of applicants to choose from but re-training costs remain consistent issue*
- *Customer Service is essential, how to incentivize teens to work at minimum wage and provide adequate services*

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WHAT BUSINESS LEADERS TELL US IN FOCUS GROUPS – North Shore LINK (formerly, Aging and Disability Resource Consortium of the North Shore)

- *Transportation is a large issue, tied with high cost of housing*
- *Employers need to work on employee growth, development and investment in an effort to improve employee retention; acceptance of the "new work environment" as the new normal if retention is to be improved (expanded cell phone usage, flexible work schedules, casual dress, etc.).*
- *Many care provider roles have historically been back-filled through immigrant workers, new tough regulation on immigrants is making these workers harder to employ*
- *Shortage of personal care workers, already some elder customers who can't be served due to shortage of staff, only the beginning of the aging boom*

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Supply Side Responses – North Shore Job Seekers and Students

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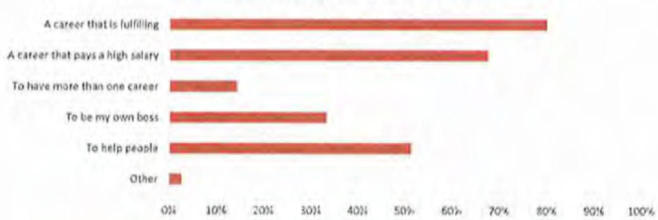
WHAT DID YOUTH/STUDENTS TELL US -

What are your hopes and dreams for the future, or what are those for your child? Please choose all that apply.



Survey Comments

- *I wish one day to become something that will help my fellow citizen.*
- *I want to make lots of money*
- *Entertain People*
- *I would rather be happy in my job than crazy rich*
- *Want to own a house, a few trucks, a boat, and a couple classic cars*

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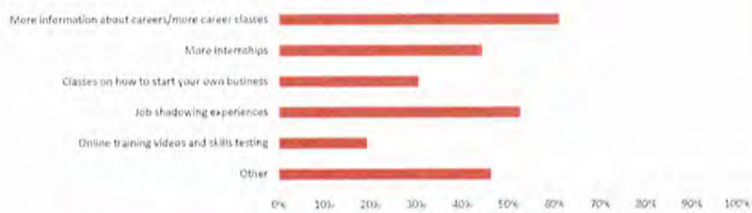
WHAT DID YOUTH/STUDENTS TELL US -

What can be added to the educational experience to help achieve these goals? Please choose all that apply.



Survey Comments

- ***Scholarships/money for college (147 times)***
- ***Classes that teach more of how to use certain equipment for current jobs***
- ***I want to know all of my options before I start choosing colleges.***
- ***Entrepreneurial encouragement***

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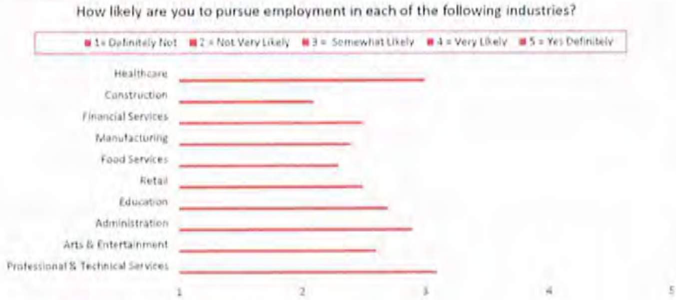
WHAT DID YOUTH/STUDENTS TELL US -

How likely are you to pursue employment in each of the following industries?



- ***We need to get them more information on our critical industries***
- ***Youth seem to know what they don't want to pursue***

Survey Comments

- ***Pharmacist, x-ray technician, or Bank teller***
- ***I would like to do something with computers***
- ***Biotech/Pharma/Medical Device***
- ***Pilot, Computer/Technical Engineer, Video/ TV, Legal/ Political***

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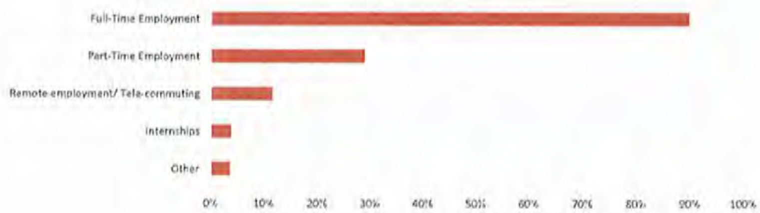
FOW

WHAT DID JOB SEEKERS TELL US -

What types of employment are you currently looking for? Please choose all that apply.



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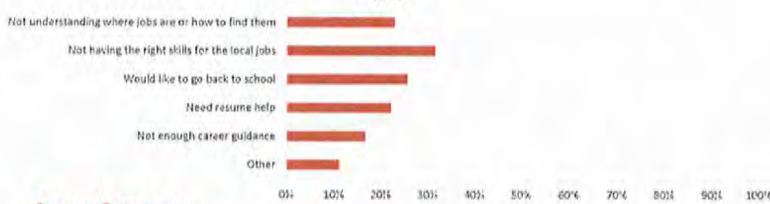
WHAT DID JOB SEEKERS TELL US -

What have you encountered as barriers to employment? Please choose all that apply.



Survey Comments

- ***I am Overqualified***
- ***Most jobs are specialized "Niche" Job***
- ***I need a Job specific to my experience***
- ***Age & Salary***
- ***Not able to match salary requirements with offers on the market***
- ***Lack of openings in my areas of expertise. Also my age***

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Intermediary Responses – North Shore Educators, Social Service Leaders, and Economic Development Professionals

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WHAT DO YOU THINK?

What do you need to help meet college and career readiness standards for your students, or to keep students actively and successfully engaged in post-secondary education? Please choose all that apply.

Exposure to business representatives outside classroom hours

Internships for students

Externships for teachers to work at companies

Career fairs

Improved educational technology

Other

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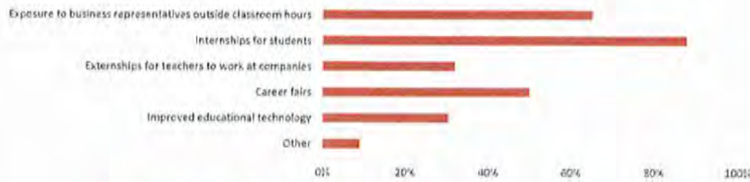
WHAT DID EDUCATORS TELL US -

What do you need to help meet college and career readiness standards for your students, or to keep students actively and successfully engaged in post-secondary education? Please choose all that apply.



Survey Comments

- ***Networking Opportunities***
- ***Expanded Voc. Tech Programs***
- ***83% of our students work, working in a chosen career path is the challenge***

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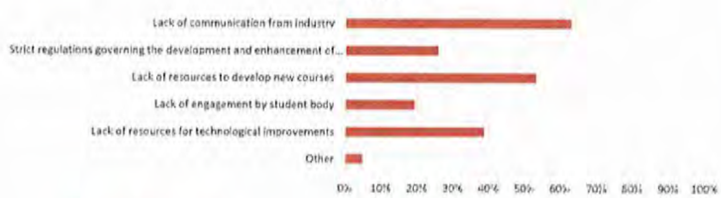
WHAT DID EDUCATORS TELL US -

What challenges do your faculty face in keeping up with the new and changing skill requirements of today's global economy? Please choose all that apply.



Survey Comments

- ***We have advisory committees with employers but need more interaction with curriculum development***

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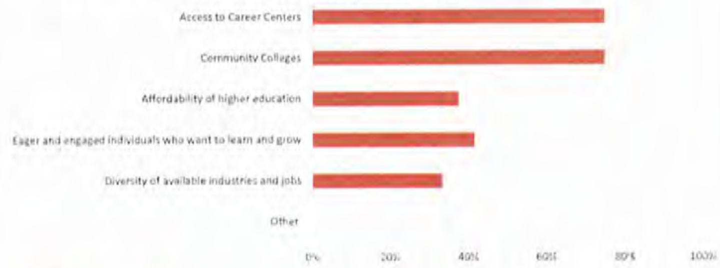
WHAT DID ECONOMIC DEVELOPMENT LEADERS TELL US -

What are the strengths of the workforce and economic systems on the North Shore? Please choose all that apply



Survey Comments

- *No pubic transportation anywhere off the rail lines*
- *Access is problem*
- *Transportation...*

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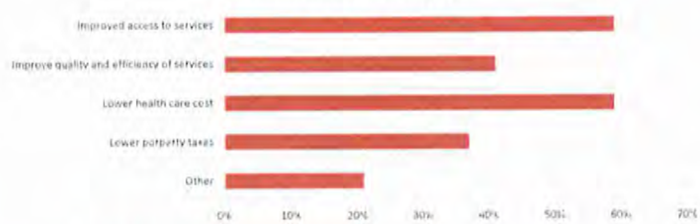
WHAT DID ECONOMIC DEVELOPMENT LEADERS TELL US -

What can we do to make the North Shore more 'business friendly"? Please choose all that apply.



Survey Comments

- *Better regional planning*
- *Transportation infrastructure improvements*

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WHAT DID ECONOMIC DEVELOPMENT LEADERS TELL US -

How helpful would each of the following initiatives or tools be for you as you develop the economy of your town or city?

Survey Comments

- *Focus on the town/city to too big…we need to think regionally*

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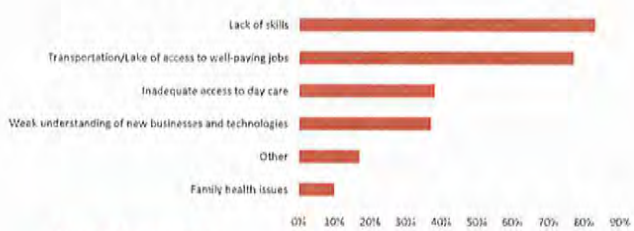
WHAT DID SOCIAL SERVICE AND COMMUNITY LEADERS TELL US -

What are the biggest barriers that are keeping your constituents from finding and keeping fulltime employment? Please choose all that apply.



Survey Comments

- *Transportation is huge barrier both financially and lack of access*
- *Many low and limited income individuals juggle not just one but many barriers*

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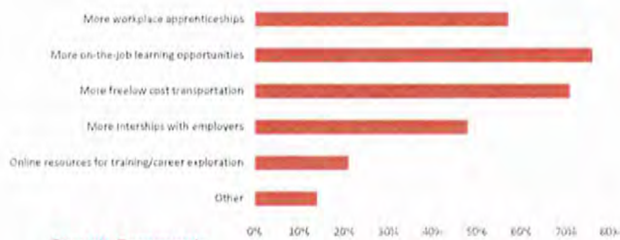
WHAT DID SOCIAL SERVICE AND COMMUNITY LEADERS TELL US -

What responses work best - or would work best - to move your constituents successfully into employment? Please choose all that apply.



Survey Comments

- ***Exposure to the variety of jobs that are out there***
- ***Job Shadowing, mentoring and coaching while in High School***

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WHAT DID WE LEARN?

Overall -

1. ***Ability and Willingness to be a constant learner!***
2. ***Technology Skill set and proficiency is a MUST***
3. ***Various Communication Skills are necessary***
4. ***Diversity in the workplace and in customers***

Emerging Workforce -

1. ***Is not interested in North Shore career opportunities (Is this an awareness issue?)***
2. ***Different from current workforce in priorities and modes of operating***
3. ***Wants fulfillment in a career on their own terms***

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SUMMARY of OUR PLAN-

1. *Support Innovative Ways of Learning for Current Workforce*
   - *Online anytime/anyplace*
   - *Quicker curriculum design and roll-out*
   - *Advocate for alternative funding mechanisms for public colleges*
     - *Help Academia change*
     - *Help Business Understand /relate to academia*
   - *Other?*
2. *Support Innovative programming to bring employers and students together*
   - *Internships*
   - *Company tours*
   - *Career Information*
   - *Other?*
3. *Support Innovative programming to bring employers and educators together*
   - *Teacher Externships*
   - *Educator/Business Conferences*
   - *Other?*
4. *Ensure technological literate and communicative workforce*
5. *Promote Diversity*

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Next Steps:

1. ***Deeper dive into this data, particularly more in-depth conversations with the FOW stakeholders on what is behind their responses, and strategy development for addressing the challenges each stakeholder is facing either individually or with other stakeholders.***
2. ***Updating of the North Shore WIB/North Shore Alliance Strategic Plans that include goals and activities around these challenges.***
3. ***Development of new Northeast Regional Strategic Plan, including the workforce, education, and economic development leaders from the North Shore, Merrimack Valley and Greater Lowell regions, basing goals and activities on this and other Future of Work data.***

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Quote from Student and future worker:

"I'd like to be able to avoid face to face communication, Customer Service, for example, would be nice."

Quote from Business:

"Teenagers have to learn how to talk on the phone"

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THE FUTURE OF WORK ON THE NORTH SHORE

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NORTH SHORE WIB WORKFORCE INVESTMENT BOARD

44

GLWDB
GREATER LOWELL
Workforce Development Board

MERRIMACK VALLEY
MVWIB
WORKFORCE INVESTMENT BOARD

NORTH SHORE
WIB
WORKFORCE INVESTMENT BOARD

Session 2 for Northeast Regional WIOA Planning

July 24 from 2:00 to 4:30

Location: Salem Five Bank Community Room

210 Essex Street, Salem, MA 01970

Agenda and other details to follow.

Your participation and input is greatly needed and appreciated! Help determine the industries and occupations of growth and importance in Northeast Massachusetts and begin discussion of a Strategic Plan around these industries and occupations! Thanks, as always, for being a part of this important effort!

Peter Farkas	Rafael Abislaiman	Mary W Sarris
Peter Farkas Executive Director Greater Lowell Workforce Development Board	Rafael Abislaiman Executive Director Merrimack Valley Workforce Investment Board	Mary Sarris Executive Director North Shore Workforce Investment Board

Amp it Up 2017

School	Staff Name	Subject(s)	Company
Danvers	Cindy Noftle	Algebra	GE
Danvers	Denise Yelle	Math	Innovent
LVTI	Malcolm Paradise	Engineering	Bomco
Danvers	Angelo Bertolino	Anatomy & Physiology, Biology	Microline
Ipswich	Mary Ham	Chemistry Biology	Medtronic
Lynn English	Joan O'Connor	Biotechnology, Forensics, Biology	Seqwell
Lynn English	Sarah Hall	Earth Science, Biology	Microline

Teacher Name(s), School and District: Cindy Noftle, Danvers High School, Danvers, MA

Course Name: Algebra 2

Lesson/Unit Name: Aviation: Newton's Laws of Motion

Science or Education Topic(s): Newton's Laws of Motion, Lift force, Velocity, Weight, and Acceleration

Engineering Technology Industry Related Field/Activity: GE Aviation

- CCSS.Math.Practice.MP1 Make sense of problems and persevere in solving them.
- CCSS.Math.Practice.MP2 Reason abstractly and quantitatively.
- CCSS.Math.Practice.MP3 Construct viable arguments and critique the reasoning of others.
- CCSS.Math.Practice.MP4 Model with mathematics.
- CCSS.Math.Practice.MP5 Use appropriate tools strategically.
- CCSS.Math.Practice.MP6 Attend to precision.
- CCSS.Math.Practice.MP7 Look for and make use of structure.
- CCSS.Math.Practice.MP8 Look for and express regularity in repeated reasoning.

When Taught: June 2017

Abstract: In 200 words or less, please provide a summary of your objectives, implementation, and the results of your implementation.

The lesson will begin with a video clip of the Blue Angels air show. The Blue Angels squad flies aircraft powered by GE Aviation F414 engines. A class discussion will follow regarding the Blue Angels and the aerobatic maneuvers that they perform.

Next will be a brief synopsis of GE Aviation and the work that they do in regards to jet engines. There are four video clips that will provide details about GE Aviation, the engineering team, and the jet engines that they produce. As they watch the video clips, students will take notes on important facts presented in the videos. Students will be guided to include information regarding the mathematics and science principles that are involved in building jet engines. There is also a link to a History of GE Aviation article.

The Aviation Performance task will be distributed to each student. In groups students will read through, discuss the information provided, analyze each example and its solution, and find the solutions to the exercises.

Students will use algebra and the Newton's laws of motion to determine exact values for variables such as lift, acceleration, energy, and mass.

Objectives and assessment: Using the table below, identify at least 3-5 learning objectives (content and/or pedagogical) and describe how each will be assessed.

Objectives *By the end of this lesson/unit, the students will be able to:*	**Assessment** *How was the objective assessed? List the example of formative or summative assessment.*
Compute weight and lift force using Newton's first law of motion	Students will work in small groups to solve specific problems related to Newton's first law of motion.
Evaluate acceleration as a change in velocity over time	Students will work in small groups to solve specific problems related to Newton's laws of motion.
Compute force, mass, and acceleration using Newton's second law of motion	Students will work in small groups to solve specific problems related to Newton's laws of motion; Each student will be given a number in the group. To present the answer, a number will be called at random. Students with that number will explain the answer to the question.
Understand Newton's third law of motion - the concept of action and reaction	Have each student write down a question and its answer to ask the whole class; Students will take turns asking their questions and discussing the responses.

Engineering/Technology Link: Please check the appropriate box(es) in question 1. And provide a brief answer to question 2.:

1. How did you *introduce* engineering/ technology concepts or the company/industry focus in your course? Check the appropriate box(es) or choose Other.

   - ☐ X Defined terms (science, engineering, technology)
   - ☐ X Described the engineering design process
   - ☐ X Engineering design challenge related to industry
   - ☐ X Overview of the company
   - ☐ X Challenge based on 'industry specific' area of focus (manufacturing process, quality control, measurement, development, teamwork etc.)
   - ☐ Other: ______________________________

2. After introducing the concepts, what did/will the students do to explore and apply the engineering/technology and industry specific concepts? (include information about the actual activity students did, discussions they had, or instructional strategies you used)
   Students will watch videos prior to working on the assigned exercises. The videos will explain the concepts. Then there will be a teacher-led discussion about the concepts. The Aviation Performance task contains 4 sections that highlight a specific example and then is followed by exercises that students will solve in their small groups. Each section will be attempted by the students and discussed as a class before moving on to the next section. This will ensure that students understand the concepts in the section before proceeding to the next section.

Level of Inquiry: Which of the following best describes the level of inquiry (adapted from Bell 2005) you used for this lesson/unit? Check the appropriate level.

- ☐ *X Structured inquiry*: Instructor provides question and procedure. Students determine the results based on given procedures.
- ☐ *Guided inquiry*: Instructor provides question. Students design procedure and determine the results.
- ☐ *Open inquiry*: Students investigate their own research question. Students design procedures and implement the procedure on their own.

Lesson Extension Plan:

Title/Topic: Use Newton's Laws of Motion to Solve Aviation Problems
Time (minutes): 90 to 150 minutes
Company Name and brief Description: GE Aviation is located in Lynn, Massachusetts. This organization primarily operates in the Aircraft Engines and Engine Parts business / industry within the Transportation Equipment sector. This organization has been operating for approximately 11 years. GE Aviation is estimated to generate $7.4 million in annual revenues, and employs approximately 24 people at this single location. The Lynn facility continues to assemble jet engines for the United States Department of Defense, subsidiary services and commercial operators. Engines assembled at this plant include the F404, F414, T700, and CFE738. The plant at Lynn also produces the -3 and -8 variants of the CF34 regional jet engine, the CT7 commercial turboprop power plant and commercial versions of the T700 turbo shaft that are also called the CT7. (source: Wikipedia)

Overview of the Lesson

The Aviation Performance task contains 4 sections that highlight a specific example and then is followed by exercises that students will solve in their small groups. Each section will be attempted by the students and discussed as a class before moving on to the next section. This will ensure that students understand the concepts in the section before proceeding to the next section.

Standard(s)/Unit Goal(s) to be addressed in this lesson:

Mathematics (Grades 9–12)

Algebra

Generalize patterns using explicitly defined and recursively defined variables
Interpret representations of functions of two variables
Approximate and interpret rates of change from graphical and numerical data
Understand pattern, relations, and functions
Represent and analyze mathematical situations and structure using algebraic symbols

Problem Solving

Solve problems that arise in mathematics and in other contexts
Apply and adapt a variety of appropriate strategies to solve problems

Understand Numbers

Understand and use ratios and proportions to represent quantitative relationships

Essential Question(s) addressed in this lesson:

What are the four forces that affect flight? How does the mass of an object affect the force needed to move it? (Answer: Lift, drag, weight, and thrust; if an object is three times as large as another object then it would need three times as much force to move it the same amount)

Objectives:

State the three Laws of Motion and solve real-world examples of these laws.

Link to Industry:

The Blue Angels fly six F/A-18 Hornet aircraft powered by General Electric's F414 engines.

What students should know and be able to do before starting this lesson:

Students should have a basic understanding of variables, equations and how to solve a multi-step equation.

Instructional Materials/Resources/Tools

Students will be provided with links to video clips, handouts, and an explanation of the objectives of the lesson as well as the expected outcome. Students will be expected to use their Chrome books and/or calculators.

Lesson Delivery

Lesson Opening

As a class, students will watch the Blue Angels Air Show video clip. A whole group discussion about the specific maneuvers that the Blue Angels execute will take place. The discussion will transition to GE Aviation and the projects

During the Lesson (activities/labs/challenges)

Students will separate into small groups to work together to go through the examples and their solutions. They will discuss the exercises and find the solutions to them. They may need to review more examples of Newton's three laws of motion.

Lesson Closing: Review the four forces that affect flight and discuss with students how thrust provides the forward force on the airplane. Ask students to explain in their own words the concept of action and reaction. Have students list the specific formulas that are used for each of the three laws of motion.
Assessment
Student Assessment: Student responses to true/false questions regarding lift, drag, weight, and thrust requiring thumbs up and down response. All responses will be tallied and discussed.
Delivery Assessment: Students liked watching the video clips and were highly interested in the Blue Angels. They were fascinated by the building of jet engines and recognized how much responsibility the engineers have to get the engine built perfectly. They found the mathematics used in the exercises to be basic and easy to do.
Extension: Students can research the role of engineers in designing aircraft. They can write a short paper describing the mathematics that engineers use in their daily work.

Additional resources and assessments: List the attachments here.
Attachments should include handouts, readings (with references), lab write-ups, rubrics, exams/quizzes, and/or other similar materials.

Blue Angels F/A-18 Jets Air Show San Francisco, CA
https://www.youtube.com/watch?v=W7Gm2Qj-n_U

GENX Engine Build Video:
https://www.youtube.com/watch?v=GKFdX4Z1QPs

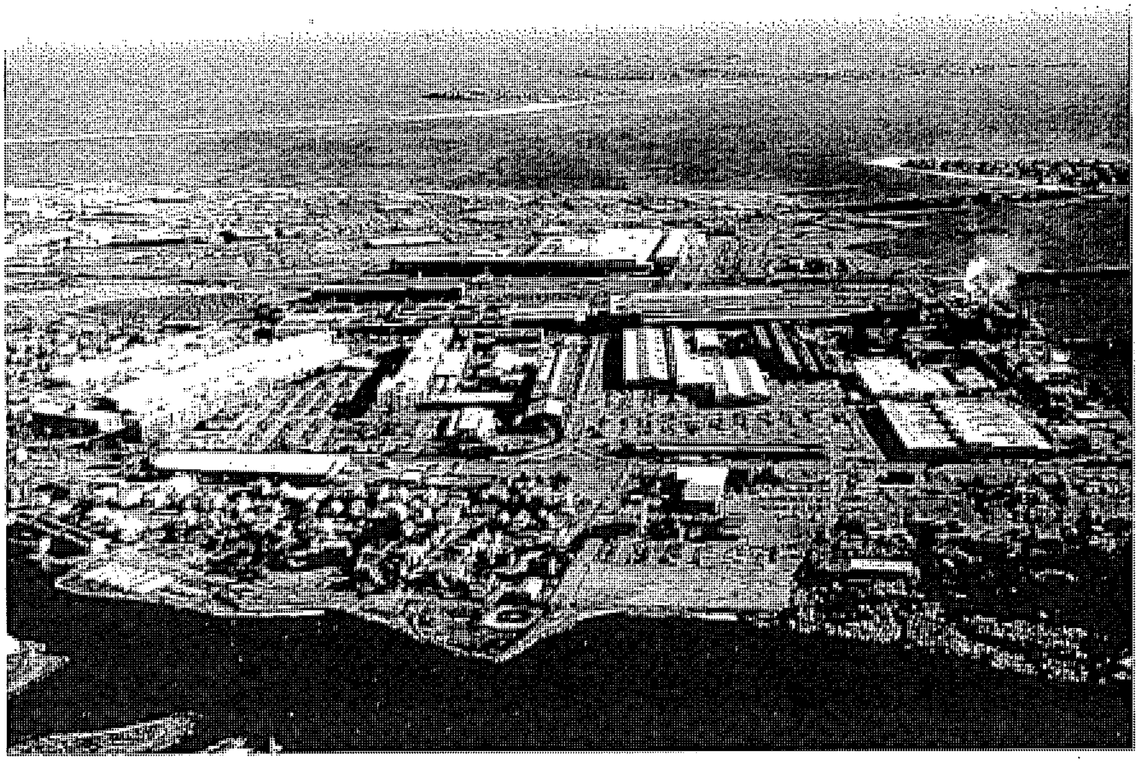
GE Aviation Jet Flight Engine Technology
https://www.youtube.com/watch?v=z9SnDrUhZxQ

GE Weather Proof Aircraft Engine Testing
https://www.youtube.com/watch?v=_PR0Ka_J2P4

Meet GE Aviation Engineering
https://www.youtube.com/watch?v=zJNMJsMd2XI

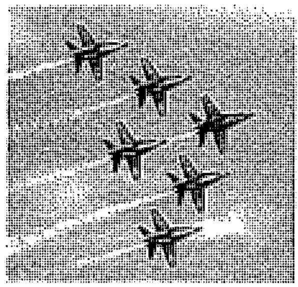
GE History
http://www.geaviation.com/company/aviation-history

GE Aviation, River Works Plant, Lynn, MA

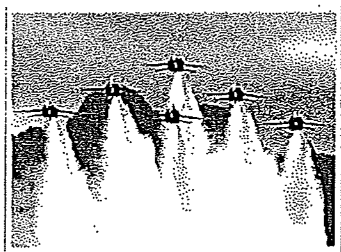


Name ____Date__________

Blue Angels

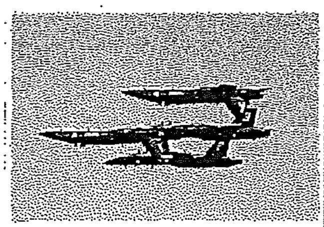


The Blue Angels is a flight aerobatic squad with pilots from the Navy and the Marines. The squadron was formed in 1946. The Blue Angels fly six F/A-18 Hornet aircraft powered by General Electric's F414 engines. They perform aerobatic maneuvers throughout the United States. The performance showcases loops, rolls, and transitions from one formation to another. In addition, some of the maneuvers include flying toward each other in what appears to be a collision course and mirror formations.

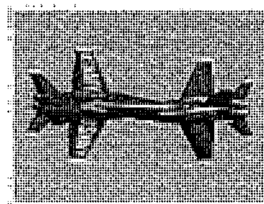


Blue Angels on Delta Formation.

Blue Angels aircraft perform the "Section High Alpha", the slowest maneuver of their show. During the maneuver the two jets slow down to 125 knots (232 km/h) as they pitch the nose of the F/A-18 up to 45 degrees.



Blue Angels in the double farvel formation.



The solos performing the "opposing knife-edge" pass. The far aircraft is actually slightly higher than the near aircraft to make them appear in-line to the audience.

When an aircraft is in flight, there are four forces acting on it. They are **lift**, **weight**, **thrust**, and **drag**. *Lift* is what pushes the airplane up, while *weight* is the gravitational force that pulls the airplane down. *Thrust* is what moves the airplane forward and creates air speed. *Drag* is a force that slows the airplane down. It is a force that acts on an object in the opposite direction that the object is moving. When the thrust is greater than the drag, the airplane moves forward. The thrust must balance the drag of the airplane when cruising. When the weight is greater than the lift, the airplane descends.

At GE Aviation the engineers use their understanding of scientific principles, such as Newton's laws of motion and mathematics to design, analyze and improve their F414 engines. Engineers use algebra to determine exact values for variables such as velocity, temperature, acceleration, energy and mass. As they design jet engines, they aim to minimize weight of the parts and materials. Some of the parts are constructed of a composite material in order keep the airplane as light a possible. When designing airplanes, the engineers apply Newton's third law of motion to determine how to power the aircraft. Using these real results enables engineers to design efficient, safe and successful aircraft.

Newton's Laws of Motion

1) Every object persists in its state of rest or uniform motion unless an unbalanced force acts it on. (Law of inertia)
2) Acceleration is produced when a force acts on a mass. For a constant mass, force equals mass times acceleration.
3) For every action, there is an equal and opposite reaction. The mass of object 1 times the acceleration of object 1 equals the mass of object 2 times the acceleration of object 2.

Name ______________________________ Date ____________

Aviation: Newton's Laws of Motion

Consider an airplane in flight. If the airplane is traveling at a constant altitude, the lift and weight cancel each other. If an airplane travels at a constant speed, thrust will equal drag. So there is no force on the airplane and it will more forward.

Example

Suppose an aircraft has a mass of 184,000 kg. What is the minimum force required to get the aircraft into the air?

Solution

The lift force must be greater than the weight of the aircraft in order for it to get into the air. To find the weight force you must use the following information.

Weight is measured in Newton's. $1\,\text{N} = 1\,\text{kg} \bullet \frac{m}{s^2}$

Mass is measured in kilograms (kg). Gravity on Earth is a constant: 9.8 m/s^2

Weight = Mass times Gravity
$W = mg$
$W = (184{,}000\ \text{kg})(9.8\ \text{m/s}^2)$
$W = 1{,}803{,}200\ \text{N}$

The lift force must exceed 1,803,200 N to get the aircraft to stay in the air.

Exercises

1. An aircraft has a mass of 179,000 kg. What is the minimum force required to get the aircraft into the air?

2. A jet is flying at a constant height of 11, 284 km with a constant speed of 1300 km/h. The jet weighs 110,000 kg. What is the force acting on the jet due to its weight?

3. Suppose an airplane has a thrust of 103, 250 N, what is the drag?

4. What happens when the drag of the plane is greater than the thrust generated by the engine?

Name ______________________________ Date ____________

Aviation: Newton's Laws of Motion

Matching

Match each definition with the appropriate vocabulary word.

1.____	The force that decreases when the spoilers are used.	A. Weight
2.____	The faster the air is pushed through the jet engine, the more forceful this is.	B. Newton's First Law
3.____	This, along with weight, acts as resistance to aircraft motion.	C. Vortices
		D. Streamlines
4.____	If thrust is greater than drag, this law describes the increase in velocity.	
		E. Newton's Second Law
5.____	When thrust and drag are in balance, this law explains why the aircraft has a constant velocity.	
6.____	Jets produce thrust through the application of this law of motion	F. Thrust
7.____	For an aircraft to fly, the lift must be greater than this force.	G. Lift
		H. Newton's Third Law
		I. Drag

Name ____ Date ____________

Aviation: Newton's Laws of Motion

Newton's second law of motion can be seen in the motion of an airplane. If an airplane is not traveling at a constant velocity, then the plane is either accelerating or decelerating. Acceleration is the change in velocity with respect to time. For a constant mass, force equals mass times the change in velocity with respect to time.

$F = ma$ can be written as $F = \dfrac{m(v_1 - v_0)}{(t_1 - t_0)}$.

Example

Suppose an aircraft has a mass of 200,000 kg and is cruising at a 250 m/s at a constant altitude. If the afterburners apply an additional thrust of 50,000 N, what speed does the jet reach in 60 s?

Solution

You can use the formula: $F = \dfrac{m(v_1 - v_0)}{(t_1 - t_0)}$. First identify the variables. Then solve for the missing variable, speed.

Additional thrust $F = 50{,}000$ N
Mass $m = 200{,}000$ kg
Initial velocity $v_0 = 250$ m/s
Final velocity v_1
Initial time $t_0 = 0$ s
Desired time $t_1 = 60$ s

$$F = \frac{m(v_1 - v_0)}{(t_1 - t_0)}$$

$$50{,}000 = \frac{200{,}000(v_1 - 250)}{(60 - 0)}$$

$$50{,}000 = \frac{200{,}000(v_1 - 250)}{60}$$

$$3{,}000{,}000 = 200{,}000(v_1 - 250)$$

$$15 = v_1 - 250$$

$$265 = v_1$$

The speed of the airplane at 60 seconds is 265 m/s.

Exercises

1. Suppose a 12,000 kg aircraft touched down at 90 m/s and it took 30 seconds to stop.
   a. What is the average acceleration of the aircraft? Explain your answer.

   b. What force is applied to this aircraft?

2. A jet is cruising at 240 mph and accelerates at an average of 0.3 m/s^2 for 450 s. What is the jet's final speed?

3. A 5500 kg helicopter accelerates upward at 4.0 m/s^2. What is the lift force exerted on the helicopter?

Name ____Date ______________

Aviation: Newton's Laws of Motion

Newton's third law of motion is critical to aircraft. There are action-reaction forces that are at work. To create lift, the wings push the air in a downward direction. The more air that is pushed downward, the greater the lift. The acceleration of an aircraft is another example of Newton's third law of motion. As the engine pushes out exhaust, the reaction force is a thrusting in the opposite direction.

Example

Suppose an aircraft has a mass of 194,000 kg collides with a seagull that has a mass of 1.8 kg.

a) Which one experiences the greater impact?

b) Which one experiences the greater acceleration in the opposite direction?

Solution

A collision between an aircraft and a seagull demonstrates Newton's third law of motion. For every action, there is an equal and opposite reaction. The mass of object 1 times the acceleration of object 1 equals the mass of object 2 times the acceleration of object 2.

The force of the seagull on the plane is equal to the force of the plane on the seagull. This means that the acceleration for the seagull will be extremely large, while the acceleration for the aircraft will be extremely small.

Exercises

For Exercises 1 and 2, fill in the blank with the appropriate word.

1. The jet engine's ______________________is accelerating a mass of gas and sending it out the tailpipe.

2. The equal and opposite ______________________ is thrust.

3. According to Newton's third law, every force is accompanied by an equal and opposite *reaction* force. Explain why these forces do not cancel each other out.

Name Key Date

Aviation Worksheet Newton's Laws of Motion

Consider an airplane in flight. If the airplane is traveling at a constant altitude, the lift and weight cancel each other. If an airplane travels at a constant speed, thrust will equal drag. So there is no force on the airplane and it will more forward.

Example

Suppose an aircraft has a mass of 184,000 kg. What is the minimum force required to get the aircraft into the air?

Solution

The lift force must be greater than the weight of the aircraft in order for it to get into the air. To find the weight force you must use the following information.

Weight is measured in Newton's. $1\,N = 1\,kg \bullet \frac{m}{s^2}$

Mass is measured in kilograms (kg). Gravity on Earth is a constant: 9.8 m/s^2

Weight = Mass times Gravity

$W = mg$

$W = (184{,}000\ kg)(9.8\ m/s^2)$

$W = 1{,}803{,}200\ N$

The lift force must exceed 1,803,200 N to get the aircraft to stay in the air.

Exercises

1. An aircraft has a mass of 179,000 kg. What is the minimum force required to get the aircraft into the air?

   $W = mg$
   $= (179\,000\ kg)(9.8\ m/s^2)$
   $= 1754200\ N$

2. A jet is flying at a constant height of 11, 284 km with a constant speed of 1300 km/h. The jet weighs 110,000 kg. What is the force acting on the jet due to its weight?

   $W = mg$
   $= (110{,}000\ kg)(9.8\ m/s^2)$
   $= 1078000\ N$

3. Suppose an airplane has a thrust of 103, 250 N, what is the drag?

   the thrust equals drag since plane traveling at constant speed.

4. What happens when the drag of the plane is greater than the thrust generated by the engine?

   the plane will slow down.

Name Key Date

Aviation: Newton's Laws of Motion

Matching

Match each definition with the appropriate vocabulary word.

1. G The force that decreases when the spoilers are used.
2. F The faster the air is pushed through the jet engine, the more forceful this is.
3. I This, along with weight, acts as resistance to aircraft motion.
4. E If thrust is greater than drag, this law describes the increase in velocity.
5. B When thrust and drag are in balance, this law explains why the aircraft has a constant velocity.
6. H Jets produce thrust through the application of this law of motion
7. A For an aircraft to fly, the lift must be greater than this force.

A. Weight

B. Newton's First Law

C. Vortices

D. Streamlines

E. Newton's Second Law

F. Thrust

G. Lift

H. Newton's Third Law

I. Drag

KEY

Exercises

1. Suppose a 12,000 kg aircraft touched down at 90 m/s and it took 30 seconds to stop.
   a. What is the average acceleration of the aircraft? Explain your answer.

$$\text{average acceleration} = \frac{(V_1 - V_0)}{(t_1 - t_0)} = \frac{0\,m/s - 90\,m/s}{30\,s - 0\,s} = \frac{-90\,m/s}{30\,s} = \boxed{-3\,m/s^2}$$

The negative acceleration means that the plane is slowing down.

   b. What force is applied to this aircraft?

$$F = ma$$
$$= (12000\,kg)(-3\,m/s^2)$$
$$= -36{,}000\,kg \cdot m/s^2$$
$$= -36000 \text{ Newtons}$$

The negative force means that the force is going against the aircraft's motion.

2. A jet is cruising at 240 mph and accelerates at an average of 0.3 m/s² for 450 s. What is the jet's final speed?

$$\text{average acceleration} = \frac{(V_1 - V_0)}{(t_1 - t_0)}$$
$$.3\,m/s^2 = \frac{V_1 - 240\,m/s}{450\,s - 0\,s}$$
$$135\,m/s = V_1 - 240\,m/s$$
$$375\,m/s = V_1$$

3. A 5500 kg helicopter accelerates upward at 4.0 m/s². What is the lift force exerted on the helicopter?

The total acceleration is 4.0 m/s² that the helicopter is accelerating plus the gravity of Earth, 9.8 m/s².

$$F = ma$$
$$= (5500\,kg)(4.0\,m/s^2 + 9.8\,m/s^2)$$
$$= (5500\,kg)(13.8\,m/s^2)$$
$$= 75{,}900 \text{ Newtons}$$

Name Key Date

Aviation: Newton's Laws of Motion

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2. The equal and opposite reaction is thrust.

3. According to Newton's third law, every force is accompanied by an equal and opposite *reaction* force. Explain why these forces do not cancel each other out.

The two forces act upon different objects; only forces on the same object can balance each other

Teacher Name(s), School and District: Angelo Bertolino, Danvers High School

Course Name: Biology

Lesson/Unit Name: Cells/Prokaryotes and Laboratory Safety

Science or Education Topic(s): This lesson plan will include information on prokaryotes/bacteria and how they reproduce and affect the world in general and humans specifically. It will also incorporate methods of laboratory safety in the work place to prevent bacterial infection. Students will be able to apply the following standard areas using this lesson:

--HS-LS4-4. Research and communicate information about key features of viruses and bacteria to explain their ability to adapt and reproduce in a wide variety of environments.

Clarification Statement:
Key features include high rate of mutations and the speed of reproduction which produces many generations with high variability in a short time, allowing for rapid adaptation.

--HS-LS4-2 Biological Evolution: Unity and Diversity

Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.

Engineering Design:

1.1 Identify and explain the steps of the engineering design process: identify the problem, research the problem, develop possible solutions, select the best possible solution(s), construct prototypes and/or models, test and evaluate, communicate the solutions, and redesign.

Scientific Inquiry Skills Standards

SIS1. Make observations, raise questions, and formulate hypotheses.
SIS4. Communicate and apply the results of scientific investigations.

English Language Arts - Common Core Standards

CCS.ELA-LITERACY.WHST.9-10.2A Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.

CCS.ELA-LITERACY.WHST.9-10.2D Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.

CCS.ELA-LITERACY.WHST.9-10.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

CCS.ELA-LITERACY.WHST.9-10.6 Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

CCS.ELA-LITERACY.WHST.9-10.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation

Next Generation Science Standards

HS-ETS1-2: Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

Engineering Technology Industry Related Field/Activity:

When Taught: September 2017

Abstract:

1. Prior to lesson the students will complete "Bacteria Webquest--Learn Your Germs" Bacteria Webquest. They will have also watched a general laboratory safety video. Lab Safety Video

2. Students will discuss why these rules are important in the classroom and brainstorm any other safety rules we can use in the classroom. They will also discuss how bacteria can contaminate any of the equipment as it is being used.

3. Have students watch MiFusion ENTcaps Tonsillectomy video. Tonsillectomy video We will discuss the lab equipment used in the video to make incisions and to remove the tonsils from the products of Microline. Discuss visit to Microline and how scissors were put together in clean room. Discuss how to enter clean room.

4. Students will be asked to brainstorm on what would happen to the patient if the surgical equipment is not from a sterile environment. They will discuss discuss what makes an environment sterile or not.
5. Students will watch a clean room video. Clean Room Video

6. Students will group and discuss how a clean room can help with sterilization of lab equipment.

7. Students will research careers that use a clean room and will write a resume for that career that highlights why a clean room is important for this career. In their explanation they will discuss what bacteria are, how they function, how they can affect humans and how their knowledge of clean rooms will help them to thrive in this career.

Objectives and assessment: Using the table below, identify at least 3-5 learning objectives (content and/or pedagogical) and describe how each will be assessed.

Objectives *By the end of this lesson/unit, the students will be able to:*	**Assessment** *How was the objective assessed? List the example of formative or summative assessment.*
Identify bacteria and diseases they may cause.	Students will fill in Webquest Template (summative)
Research lab and Clean Room safety	Groups will watch videos and discuss findings/ideas
Research careers that will use clean rooms	Students will complete a graphic organizer (formative)
Research issues of bacteria within the body	Students will complete a graphic organizer (formative)
Write a resume for a chosen career that uses a clean room	Students will complete resume with all explanations noted in abstract (formative)

Engineering/Technology Link: Please check the appropriate box(es) in question 1. And provide a brief answer to question 2.:

1. How did you *introduce* engineering/ technology concepts or the company/industry focus in your course? Check the appropriate box(es) or choose Other.

- ☐ x Defined terms (science, engineering, technology)
- ☐ x Described the engineering design process
- ☐ x Engineering design challenge related to industry
- ☐ x Overview of the company
- ☐ x Challenge based on 'industry specific' area of focus (manufacturing process, quality control, measurement, development, teamwork etc.)
- ☐ Other: ________________________________

2. After introducing the concepts, what did/will the students do to explore and apply the engineering/technology and industry specific concepts? (include information about the actual activity students did, discussions they had, or instructional strategies you used)

Students will be asked to research careers that will be using a clean room. They will research that career and how the safety they have learned in class will benefit their success in their anticipated work situation.

Level of Inquiry: Which of the following best describes the level of inquiry (adapted from Bell 2005) you used for this lesson/unit? Check the appropriate level.

- ☐ x *Structured inquiry*: Instructor provides question and procedure. Students determine the results based on given procedures.
- ☐ *Guided inquiry*: Instructor provides question. Students design procedure and determine the results.
- ☐ *Open inquiry*: Students investigate their own research question. Students design procedures and implement the procedure on their own.

Lesson Extension Plan:

Title/Topic: Safety in the Real World
Time (minutes): 2 class periods and one project to be completed at home

Company Name and brief Description: **Microline in Beverly, MA. Makes surgical equipment.**	
Overview of the Lesson Students will be introduced to real world applications of safety in the laboratory environment.	
Standard(s)/Unit Goal(s) to be addressed in this lesson:	
Essential Question(s) addressed in this lesson: Why is laboratory safety important in the world today?	
Objectives 1. **Identify bacteria and the health issues bacteria can impose** 2. **Identify safety in the laboratory environment** 3. **Identify what a clean room is and why it is important for today's workforce.** 4. **Research careers that will directly use the learned safety precautions learned.** 5. **Prepare students for a career in a biotechnical field.**	
Link to Industry: **Students will become aware of what a clean room is and how it functions.** **Students will become aware of the many technical careers that use a clean room facility** **Students will become aware of the importance of sterilizing equipment and to maintain a bacteria free environment.**	
What students should know and be able to do before starting this lesson **Students will need to be able to use the internet and graphic organizers presented.** **Students will need to know bacteria can infect humans to cause disease and/or death.**	
Instructional Materials/Resources/Tools **Computer for webquest, videos and research** **Graphic Organizers/Templates** **Examples of Microline tools--Precision Cut Scissors/Clip Appliers, Super-Atrau Graspers etc.**	
Lesson Delivery	
Lesson Opening **The lesson will begin with a discussion on how bacteria can be detrimental to human health. We will discuss what happens when bacteria invades the body and ways to prevent this from happening.**	
During the Lesson (activities/labs/challenges)	
1. Students will discuss why these rules are important in the classroom and brainstorm any other safety rules we can use in the classroom. They will also discuss how bacteria can contaminate any of the equipment as it is being used.	
2. Have students watch MiFusion ENTcaps Tonsillectomy video. Tonsillectomy video	

We will discuss the lab equipment used in the video to make incisions and to remove the tonsils from the products of Microline. Discuss visit to Microline and how scissors were put together in clean room. Discuss how to enter clean room.
3. Students will be asked to brainstorm on what would happen to the patient if the surgical equipment is not from a sterile environment. They will discuss discuss what makes an environment sterile or not.
4. Students will watch a clean room video. Clean Room Video
5. Students will group and discuss how a clean room can help with sterilization of lab equipment. 6. Have suit, beard and face mask, goggles, cap, gloves and booties available for students to dress in and try on. 6. Students will research careers that use a clean room
Lesson Closing Students will write a resume for that career that highlights why a clean room is important for this career. In their explanation they will discuss what bacteria are, how they function, how they can affect humans and how their knowledge of clean rooms will help them to thrive in this career.
Assessment
Student Assessment: Students will write a resume for that career that highlights why a clean room is important for this career. In their explanation they will discuss what bacteria are, how they function, how they can affect humans and how their knowledge of clean rooms will help them to thrive in this career.
Delivery Assessment: Students will be assessed using a rubric for completion of each portion of their resume. They will be assessed on their research and knowledge of bacteria and how safety and the use of a clean room will help them in their chosen career.

Additional resources and assessments: List the attachments here.
Attachments should include handouts, readings (with references), lab write-ups, rubrics, exams/quizzes, and/or other similar materials.

Other attachments:

1. Bacteria Webquest.

2. Lab Safety Video
3. Tonsillectomy video
4. Clean Room Video
5. Career Template for Clean Room
6. Bacteria Template
7. Rubric for Resume