Integrated STEM Lesson Plan ‘’FINAL’’

Title: Soldier for a Day

Grade Level : 6

Time: Overview and Mission Brief: 45 minutes
Module 1 : Clothing and Equipment: 45 – 60 minutes

The intent of this lesson plan is not for it to be used in a classroom but to be used at the Natick Soldier Research Development and Engineering Command (NSRDEC) as an outreach STEM activity for middle school students visiting/touring the installation for the morning. Due to limited time constraints it is important to maximize the time available and make the visit a learning experience for students. Therefore there needs to be a focus on specific learning points and succinct experiences (preferably hands-on activities) to guide students and reinforce key takeaway points. NSRDEC has four core competencies: soldier clothing and equipment, food, shelter and air drop. In this lesson plan I will concentrate on the soldier’s clothing and individual equipment. I choose “Suited for Spacewalking” (NASA, n.d.) as my data integration source because like astronauts, soldiers have captured the imagination of children for generations. The uniforms and equipment the soldier wears and carries sparks the interest and curiosity of not just children but adults as well. People love to try on soldiers’ uniforms and equipment and take pictures dressed up as a soldier. Much like astronauts, soldiers need to be prepared to function under very austere conditions and they too have specialized uniforms and equipment to provide protection.

One of the major challenges with designing clothing, individual protection and equipment for the soldier is **weight.** NSRDEC researchers are constantly challenged with lightening the soldier's load. Therefore in presenting the soldiers' clothing and equipment items the impact of weight or load on performance (and thus the student's ability to complete the mission) will be highlighted. When possible, we will discuss similarities and differences of soldiers clothing and equipment in relation to items students may wear or be familiar with such as helmets – bike, ski, baseball, football helmets etc. vs. the soldier's helmet.

Goals/objectives of the overall project:

Primary Goal: To engage students in the decision making processes and tradeoffs associated with designing and selecting clothing and equipment items for soldiers focusing on the science behind the soldier.

Secondary Goals: Bring structure and meaning to the tours conducted at NSRDEC (Natick Soldier Research, Development and Engineering Center).

Provide students with an understanding of what NSRDEC does, and how it relates to the soldier (real world) - a meaningful glimpse at the science, engineering, math, technology and designing that goes into the soldiers' clothing in the limited time available without overwhelming them.

For students to gain a deeper appreciation for our soldiers**.**

STEM Integration - Crosscutting concepts will be explored

Science: The impact of environmental effects such as climate, weather, and terrain will be discussed as it relates to clothing and equipment decisions as well as logistic considerations such as resupply, shelter etc.

Technology: Different design features will be evaluated and changes made to items based on technological advances and soldier feedback will be discussed.

Engineering: A backward engineering approach (Bybee, 2013 pg.60) will be utilized. As we step through the engineering design process, the soldier/student will be the platform and his/their "system" will be built based on mission requirements.

Math: Data will be collected. Cause and effect relationships will be established between weight, protection and performance.

Standards utilized throughout this lesson plan. It is unrealistic to expect students to master any standard in the limited time available. This "lesson" is to make their visit to NSRDEC a fun learning experience which reinforces the standards they are learning in school and put them into a "real world" context. The standards outlined below will be used not just in this lesson or module but those I hope to develop in the future (as described at the end of this lesson plan). Some of the standards are integrated into the mission brief materials due to time constraints and other will be implemented through hands on experiences.

Next Generation Science Standards (NGSS, 2013)

MS-ETS1-2 Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

MS-ETS1-3 Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

Common Core State Standards Connections (NGSS, 2013)

SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.

Tenets of the Nature of Science (NGSS, Appendix H, 22013 and NGSS, NOS, 2013))

Scientific Investigations Use a Variety of Methods
Scientific Knowledge is based on Empirical Evidence
Scientific Knowledge is Open to Revision in Light of New Evidence

Science and Engineering Practices in the NGSS (NGSS, Appendix F, 2013)

Practice 1 Asking Questions and Defining Problems
Practice 4 Analyzing and Interpreting Data
Practice 5 Using Mathematics and Computational Thinking (qualitative and quantitative data)
Practice 6 Constructing Explanations and Designing Solutions (tradeoffs)
Practice 8 Obtaining, Evaluating and Communicating Information

''All Standard, All Students"; Making the NGGSS Accessible to All Students (NGSS, Appendix D, 2013)

Common Core State Standards for Mathematics (CCSSM) (NGSS, Appendix L)

MP1 Make sense of problems and persevere in solving them
MP2 Reason abstractly and quantitatively.
MP4 Model with Mathematics (weather)
MP5 Use appropriate tools strategically.

Cross cutting concepts

Patterns
Cause and effect: Mechanism and explanation
Scale, proportion, and quantity

Disciplinary Core Ideas (Pratt, NSTA, 2012)

Earth and Space Sciences

ESS2: Earth's systems
ESS2.D Weather and Climate

Engineering, Technology, and Applications of Science

ETS1: Engineering design
ETS1.A: Defining and Delimiting an Engineering Problem
ETS1.B: Developing Possible Solutions
ETS1.C: Optimizing the Design Solution
ETS2: Links among engineering, technology, science, and society
ETS2.A: Interdependence of Science, Engineering, and Technology

Lesson Plan

Engage : The purpose for the ENGAGE stage is to pique the students' interest and get them personally involved in the lesson, while pre-assessing prior understanding.

Introduction : The day will begin with a mission brief. In the brief we will provide the context for the decisions the students (as soldiers) will need to make. Students need to become mentally engaged in the concept of what their mission will involve (Bybee, 2013, pg. 58).

Engaging Context

Did you ever wonder what we do at the U.S. Army Natick Soldier Research, Development and Engineering Center (NSRDEC)? Can you imagine what it is like to be a soldier? Today we will take you behind the scenes as you become "A Soldier for a Day". We will be sending you on a mission - to patrol the mountains of Afghanistan. Pay close attention as you learn about the science behind the soldier because your life or the life of a fellow soldier may depend on it! In the next few hours you will need to decide which items you will need to reach your goal- for everyone to successfully complete the mission and safely return to base camp.

The students will be given an overview of their mission (a mission brief) before breaking up into groups. This lesson plan will cover the initial briefing and the clothing and equipment module. The ultimate goal is to develop multiple modules which will be presented by subject matter

experts and integrated into the overall theme related to NSRDEC's core competencies – clothing and equipment, food, (food, nutrition, water and food packaging), air drop, and shelters. Each module will be tied into the mission requirements with the emphasis on lightening the soldiers load while maximizing his performance and attaining the highest level of protection.

Mission Briefing

Mission: To patrol the mountains of Afghanistan.

Goal: For every soldier to successfully complete the mission and to return safely to base camp.

Briefing: A briefing will be given to all students. All students start with the same baseline information. (Bybee, 2013)

The briefing will consist of the following information and will be conducted using PowerPoint slides utilizing data tables and pictures whenever possible.

Map showing the location of their deployment

Photos showing the terrain of the area they will be patrolling

Typical Weather Conditions: The average temperature, record temperature, average rainfall and number of snow days for any given month. The month of the actual tour is highlighted to make it more realistic.

Map Showing Mission Location

Photo of Terrain

Location	Kabul Afganistan											
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Average Temperature (° F)	40	42	50	63	74	84	89	89	83	69	55	45
Record Temperature (° F)	44 - 57	53-63	72-76	85-91	92-112	100-139	102-144	101-147	95-134	87-104	76-77	56-64
Average Rainfall (inches)	2.32	2.89	3.42	3.78	3.05	1.54	1.71	1.59	0.59	0.98	1.18	1.59
Snow (Day)	10	9	3	0	0	0	0	0	0	0	1	4

Typical Weather Conditions

All this information will be important in determining the clothing and equipment which may be needed, the supplies that may be needed, how supplies will be obtained and/or methods of resupply (for example vehicles, air drop, hand carried), natural shelter and/or required shelter etc.

Other Important Factors to Consider and/or required to successfully complete your mission:

Physical fitness:

- Fitness provides fuel
- 3 out of 4 military-age adults are physically in capable of serving in the military (Barringer, 2018)
- Are you and **Asset or Liability** in a tactical situation?

Need to be physically fit when:

- engaging the enemy
- saving a life

Food and Water

- How many calories will you need to sustain yourself while on the mission?
- How much food will you need?
- Will you need to heat your food if so how will you do this?
- How will you dispose of food packaging? You do not want to leave a footprint or give location away to enemy.
- How much will your food supply weigh?
- How much water will you need each day? Will you carry the water – how much will that weigh? (I plan to develop a separate module on water filtration.)
- How much space is your food and water going to take up in your rucksack/backpack?

Clothing and Equipment

- What type of clothing will you need?
- What type of equipment will you need?
- What level of protection will you need?
- What does each item contribute towards the load (weight) you are carrying?

Airdrop

- What form of transportation will you use?
  - Foot
  - Vehicle
  - Air Drop

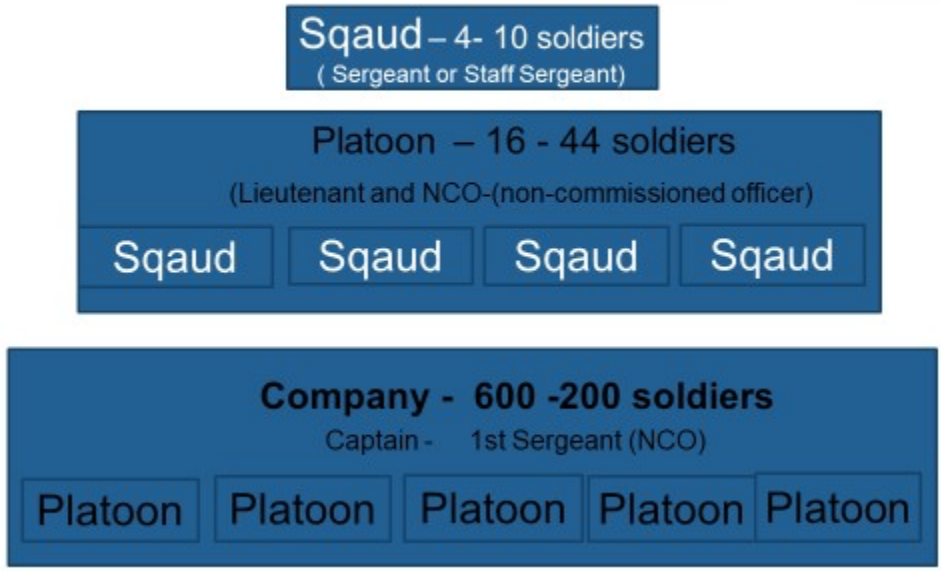
- How will you get supplies to Forward Operating Bases (FOB), Combat Outposts and Patrols?
  Hand Carry
  Transport - Vehicles
  Air Drop – A separate module is being developed to address the importance of parachutes (both personnel and cargo), wind, air speed, aircraft etc. and the effect these factors have on glide path ratios which ultimately ensure supplies reach the intended drop zones and soldiers in the field who may need to be resupplied by air. (The weather and terrain conditions from the mission brief will also be utilized in this exercise.)

Shelter

- Will you need shelter or will there be some natural shelter that can be utilized?
- What are your options Forward Operating Bases (FOB), Combat Outposts?

Logistics

The students will be divided into "troops" as outlined below: Chaperones/teachers/tour guides will be the squad/platoon/company commanders.



Before exiting the mission brief:

Each squad or company will be instructed to pick up the materials they will need to complete their mission - a **map** of the installation and compass to navigate to their modules or demos. The tour/ mission will be located in different rooms and different buildings throughout the installation. (Each group will be accompanied by an employee who will ensure they make it to the right location. This exercise is to experience navigation, much like a soldier in the field without a GPS system.)

Supplies needed to successfully complete your mission:

Map
Compass

Agenda with module/demo location and schedule including time.
Worksheet packet to fill in the information required.
Identification (or hint) of item to be picked up at each location.

(Soldiers need to follow directions and obey orders – their life or another soldier's may depend on it!)

This preliminary information and experience is to engage the student - to help them take on the role of a soldier for the time they are at NSRDEC - to change their mindset so they begin to think and act like a soldier, taking on the challenges they will face as they "walk in the boots of a soldier".

Map of installation and compass to use for navigating to demo sites

Demo or Module 1: Clothing and Equipment

Explore and Explain

The purpose for the EXPLORE stage is to get students involved in the topic; providing them with a chance to build their own understanding.

All students will start with a common base of experience (Bybee, 2013, pg. 58). The mission brief will provide specific information and highlight important factors which may impact the mission and need to be considered in the decision making process.

Ballistic Protection

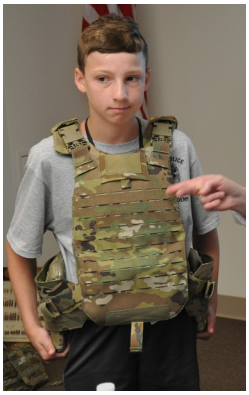
Task 1: First we will discuss the **Body Armor Systems**. Students do not have enough time to design their own ballistic protection so I will walk them through the Engineering Design Process – why , how, what solutions does it solve etc. and discuss the impact design decisions have on the soldier's weight and performance.

The whole squad/platoon will compare two generations (Gen I and Gen II) of the Modular Scalable Vest (MSV). The MSV is part of the Soldier Protection System (SPS) and is the Army's next generation Personal Protective Equipment (PPE) system.
SPS is designed to defeat current threats at a reduced weight and is **modular, scalable, and tailorable.**

We will go over the design features and compare and contrast the different features.

Two volunteers will be asked to put on a vest (one will be the Gen I and the other the Gen II vest) and I will elicit responses from the students/soldiers through asking a series of questions and guiding them through the discussion points outlined in the chart below until all the differences in the two vests have been discussed. Discussions will be centered on form, fit, and function.


Gen I vs. Gen II

The differences between the two generations are listed below:

MSV		
	Gen I	Gen II
Ballistic Coverage	1 in around plate	1/2 in around plate - eliminates bulk
Front panel	webbing	laminated laser cut fabric
	(color fastness to washing an issue)	cover ERM strap
	Shoulder buckles	Male buckles on shoulders repairable
		metal loop on shoulder buckles -
		3 point release
		moved down - better shouldering of weapo
	side buckles	center buckles
		(webbing tightens forward instead of rearward)
	coil zipper	individual element side fastener - more durable
Back Panel	webbing	Laser cut on bottom flap
	shoulder pads	narrower, sleeker, longer no ballistics (in shirt)
		webbing routing changed to accommodate oval loop
	foam insert on lower back 1/4 in for lumbar support	foam insert on lower back 3/8 in - more coverage
	care label on outside	inside vest to prooect wear and fading
Side plate carrier	curved design	straight cut design
	7 inch width	5 inch width
		no ballistics
Vest weight	10.06 lbs	8.71 lbs

We will highlight the weight differences and its impact on bulk. We will discuss the different types of protection the vest provides and the difference between the “soft” armor or fabric panels vs. the “hard” armor or plates.

I will ask students to think about how we were able to reduce the weight of the system while providing the same protection. We can also discuss the definition of a meaningful weight reduction. We will discuss how technology insertions - lighter weight materials – Kevlar vs. ultra-lightweight polyethylene have contributed to the reduced weight (and bulk) of the system. We will explore the number of soft layered materials used and the ability of the material to entangle bullet fragments to slow down the penetration vs. the plates which are hard and just stop them. And we will discuss the tradeoffs of wearing a soft armor system over a combination of soft and hard armor. I will pass around soft armor and hard plates for the soldiers/students to explore - they can get a closer look and get a feel for their weight.

Other design features integrated into the vest will be discussed as well as their function – esthetics vs. function and utility.

- Quick release – vest can be removed for medical treatment
- Drag Strap – max 400 lb.

- Positioning of components to maximize “real estate”

We will discuss the modularity of the system and the scalability (See Tier 1 -4 below) and its impact on weight, and protection. We will discuss why soldiers may choose one over the other in the context of protection versus mission performance and discuss the tradeoffs associated with each decision.

Students will be provided with a worksheet similar to the one below to fill out. They will be encouraged to take notes during the discussion and confirm weights in their lab.

Weight Worksheet

	Selection	Quantity	Weight lbs	gms
Clothing Items - Uniform				
Helmet				
Ballistic Vest - Total Weight				
Weight without hard plates				
without side plates				
Ruck Sack				
with MRE's				
Assault Pack				
	MRE			
	Water			
Parachute				
Total Weight - soldier's burden				

Notes: What is the best way to pack your ruck sack?

Task 2: **Ballistic helmets**

We will discuss applications were students wear helmets, fit and function: bike helmets vs. Army helmets.

I will elicit responses from students (Keeley, 2013) by starting with items they can relate to - the helmets they wear (bike, ski, football, skating etc.) For protection comparing and contrasting them to the helmets soldiers' need by highlighting the function of the helmets and their intended uses and lifecycle.

Here I introduce the concepts of compressional recovery and impact resistance.

Styrofoam- no recovery – need to replace

Pad vs sling suspension – Recoverable – needed for IED, parachute fall, automobile crash

See slide below which will be used to illustrate these points as well as actual helmets – bike helmets and soldiers' helmets to illustrate the differences in the padding and designs.

Emphasis will be given to the common goal of all helmets: To eliminate Traumatic Brain Injury (TBI) and concussions.

We will talk about some of the design features important in the Advance Combat Helmet (ACH) again highlighting reduced weight and improved protection. The following points will be discussed:

- Lighter than Personnel Armor System for Ground Troops (PASGT) helmet (previous Army helmet)
- Provides improved protection
- Pre drilled bracket hole for night vision device (NVD), flame and moisture resistant
- Pads act as suspension system and provide impact protection
- Improved retention system(IRS) for better fit , adjustability and stability
- Design provides comfort without degrading vision or hearing

Soldiers Uniform – FR or Non FR

Next we will discuss various protection built into the soldiers' uniform - insect repellency, water resistance, wrinkle resistance, flame resistance, chemical protection, environmental protection (NASA, n.d. pg. 9), signature management (camouflage patterns), and moisture management, along with the physical properties of the material - breaking strength (NASA, n.d. pg. 51), tearing strength, colorfastness, durability /abrasion (NASA, n.d. pg. 57), lightfastness etc. and the impact these characteristics have on the uniform's overall performance, the design of the item (NASA, n.d. Pg. 11-16) and the soldier's ability to perform his mission or tasks. (NASA, n.d.) Here weight, and bulk as well as other considerations such as comfort will be discussed in

relation to the performance of a soldier's mission. (Each one of these areas could be an individual lesson plan by themselves so the challenge is to present a general overview to provide students with a meaningful glimpse at the science, engineering, math, and designing that goes into the soldiers' clothing in the limited time available without overwhelming them but making them realize that **uniform fabrics are selected for specific reasons and different uniforms serve different purposes.**)

Discussions will focus on the need for FR (flame resistant) protection based on their mission requirements and the threat of IEDs (Improvised Explosive Devices**)** in Afghanistan. They are lucky because they will be equipped with the most advanced uniform in the system to protect them against the threats they will encounter**.** We will discuss the differences between the Army Combat Uniform (ACU) and the FR ACU which was designed specifically for use in theater for troops deploying to Iraq and Afghanistan. We will discuss the tradeoffs using the chart below in general terms such as durability (fiber content), cost (FR ACU more expensive – current costs will be provided) but most important focus on the main purpose of the uniform FR protection.

Army Combat Uniform (ACU)	Flame Resistant Amy Combat Uniform (FRACU)
Not flame resistant	Flame Resistant (FR)
50% nylon/50% Cotton (50/50 NyCo)	65% FR rayon/25% pararamid/10% nylon
Factory treated with pemetherin (insecticide)	Factory treated with pemetherin (insecticide)
Functional/durable	Same design as ACU
Button cargo pockets	Button cargo pockets
Reinforced crotch	Reinforced crotch
Infared Tab	Infared Tab
Wrinkle free finish	

We will watch a video of a full scale manikin burn test (ASTM F1930) to provide the visual impact of the protection the uniforms provide in a flame/fire environment. This exercise is meant to illustrate all uniforms are not created equal and the need for different uniforms is based on the threat as well as environmental factors and the required performance. The last frame of a 4 second burn test is depicted below (I could not embed the video). I will ask the students/soldiers which uniform they would rather be wearing. I will explain a little about the development and fielding of the FRACU uniforms in Iraq and Afghanistan and the impact they had on reducing burn injury in the field.

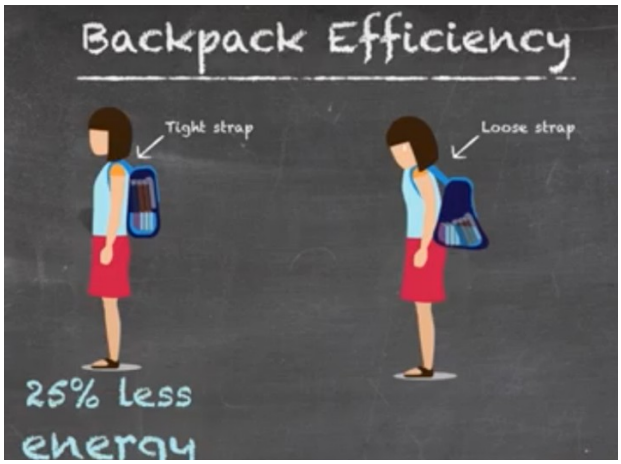
Equipment

Lastly, we will discuss how to pack a rucksack most efficiently and the impact on performance (maximizing load and energy) again drawing on a student's own experience in carrying backpacks.
We will explore the weight of MREs (Meal Ready to Eat) and the space they occupy in a soldiers rucksack and/or assault pack. (This will tie into a separate module on building an MRE – how it is designed – nutritionally - what goes into it, discussing weight, nutrition, bulk, shelf life etc. and its impact on performance.)
We will discuss how to back your rucksack (equivalent to a student's backpack) most efficiently. The slides below will be projected so the platoon/squad can see them:

You will get 25% more efficiency if the backpack is

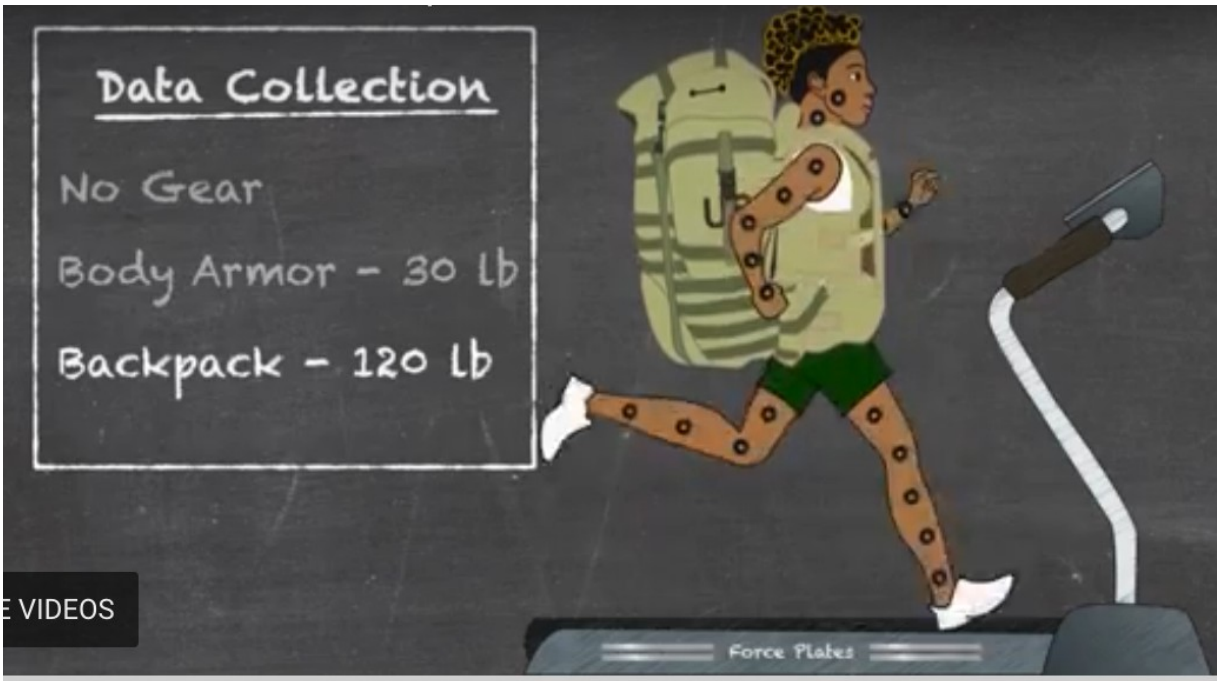
- High on your shoulders – tighten the straps
- The weight inside the backpack is at the top and close to body

(These slides are screen shots from a TV show -video clips may be substituted as some point but this will require video editing. Source: Science Channel. February 24, 2017.)



We will also discuss the average weight a soldier carries between his backpack and body armor. I will ask students to estimate the weight before revealing the slide below.

Throughout the process we will discuss the tradeoffs or decisions the soldiers/students need to make and the impact of those decisions on the outcome of their mission. We will discuss the influence of the environment – climate – protection levels, comfort and other factors which play into the soldier's decision making process emphasizing weight as a key factor and bulk which may affect the soldier's ability to perform his mission. Here we will discuss the "designers" and engineer's vision vs. the soldiers use and the importance of considering the users' needs and requirements as well as the functionality of a product in designing it. Answering questions such as:
Is it worth the weight? Is it absolutely needed or nice to have?



Elaborate/Extend

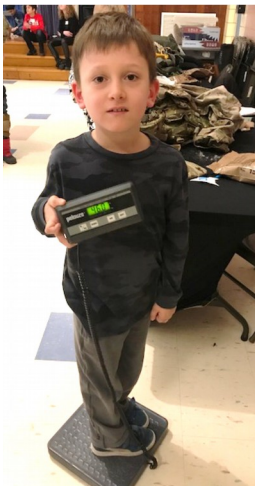
The purpose for the EXTEND stage is to allow students to use their new knowledge and continue to explore its implications.

Students will be given the opportunity to conceptualize their learning applying their newly acquired knowledge along with already acquired skills and abilities. (Bybee, 2013 Pg. 58)

Tools available:
Worksheet
Floor scale
Handheld scale
Rulers







77 lbs. 46 lbs.

Modular Scalable Vests

Students will have the opportunity to try on the two vests, weigh them, and take them apart to see what the different tiers look like and how they feel when they are worn.
Students will be asked to record the weight of the two vests with and without the hard plates and with and without side panels.
Then try on the two systems and see if they notice any weight difference.

Ballistic Helmet

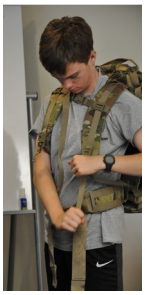
The **students will have a chance to try on a ballistic helmet** and see how it feels and weigh themselves with the helmet on and off to see what the weight gain is or just weigh the helmet itself to determine its weight.

ACU vs. FRACU

Both **uniforms will be available for the students to try on, feel or just look a**t to see how they differ. They are both about the same weight but provide very different performances and protection.







Rucksack/ Assault Pack/ MRE

Students can try on the rucksack with and without the ballistic vest and with and without MREs and experience firsthand its weight and bulk. Students (as soldiers) will experience firsthand some of the design challenges NSRDEC faces. We will discuss some of the tradeoffs which may need to be made.

Students will be asked to provide a comparison of weight differences.

At this point I will take the opportunity to discuss the accuracy in measurement and discuss the different ways students choose to perform their measurements and how that may affect the accuracy of measurements.

We can also discuss the standard Si units (metric) vs British units of measure**.**

This learning environment will be fairly open and students will be given the opportunity to ask more in-depth questions, at any point, if desired.

Data obtained through the use of scales will allow students to put everything in perspective – (how much did it weigh – did they perceive the difference in weight between different systems etc.) **The combination of actually experiencing the weight and then recording the data and translating it into a concrete value - weight gain (lbs.) is a very powerful learning tool and it reinforces the impact of weight on performance first hand**. It is an eye opening experience!

Students will leave this module with their worksheet (and notes) as well as a ruck sack or assault pack to be filled with items needed to complete their mission from other modules on their route**.**

Evaluate

The purpose for the EVALUATION stage is for both students and teachers to determine how much learning and understanding has taken place

Evaluation of Module 1: Clothing and Equipment

While the students are exploring the use of the equipment, weighing clothing and equipment and trying it on. I will be asking questions and getting feedback from the soldiers/.students. We will discuss various design features and weights. **As a group, we will take this data/information and look at it in the context of the mission and decide what the soldier/they need for their mission, how much weight it will add to their load and discuss how that may affect their performance in relation to weather conditions, nutrition, physical fitness etc**.

Formative assessments in the form of observation (Dirksen, 2011) will be conducted throughout the module.

Collaborative learning (Dirksen, 2011) will be encourage and it is the goal for the whole team to successfully complete the mission. Students will be learning from one another throughout the exercise and will have an opportunity to discuss how the items feel when they are worn and document the actual weight.

Summative assessments will give students the opportunity to adjust their assumptions if needed. (Dirksen, 2011.)

Students will be asked to reflect (Keeley, 2013) on how their thinking has changed as a result of the exercise.

Measurable Objectives:

1. All students should be able to collect data on the weight of at least one MSV in two configurations – with soft armor and with both soft and hard armor and if time permits, with and without side plates.

2. Each students will have the opportunity to try on and weigh ruck sacks with and without MREs.

3. Students should begin to understand the impact of design decisions on performance and protection as well as experience the weight of different clothing and equipment systems such as one vest or vest plus rucksack and/or helmet.

4. Students should also begin to understand the impact of the environment – weather conditions and threats - on clothing and equipment choices and realize soldiers' uniforms and equipment are not one size (or design) fits all. The importance of form, fit, and function should be realized by the end of this module.

5. Students will be given the opportunity to explore other clothing items such as the ACU, FRACU, FR gloves, helmet, fleece shirts, aircrew and combat vehicle coveralls.

As students rotate through their modules there will be one key point emphasized and/or something each team will need to acquire during the module to carry back to the rendezvous point. This will also be an informal way of ensuring the students are engaged and have picked up on the key take away point from the module. (Students like a little friendly competition!)

Students will leave this module with their worksheet (and notes) as well as a ruck sack or assault pack to be filled with items needed to complete their mission from other modules on their route**.**

Evaluation of Overall Soldier for a Day Mission

At the end of the tour/mission there will be an out brief on the mission, to summarize the day's events and to highlight what the students have learnt as "soldiers" - the science behind the soldier.

Time permitting we will do an assessment in the form of a "jeopardy" or trivia game board. Students will answer questions based on data, observations or findings they have collected while performing their mission. The "team's" score will determine if they have successfully completed their mission. This concept is used by the Museum of Science in their Engineering is Elementary series.
http://info.eie.org/water-reuse-thank-you-page?submissionGuid=a319f026-0f8b-4902-b1e4-c207be4f41d9

The squads/platoons who collected all of the items needed to successfully complete the mission and packed it in the most efficient manner will be recognized.

Each student will be recognized as a participant in, and for successfully completing the "Soldier for a Day" mission in the form of a certificate.

Follow on Modules to be Developed

While time is a major constraint with school visits, additional modules focused on specialized areas could be incorporated such as signature management (camouflage patterns), and moisture management, along with the physical properties of the material - breaking strength (NASA, n.d. pg. 51), tearing strength, colorfastness, durability /abrasion (NASA, n.d. pg. 57), lightfastness etc. and the impact these characteristics have on the uniform's overall performance, the design of the item (NASA, n.d. Pg. 11-16) absorption and radiation (NASA, n.d. pg. 75), getting the right fit (NASA n.d. pg77), field of vision in helmet design and light transmission (NASA, n.d. pg. 90-91), and microclimate cooling (NASA, n.d. pg. 71). All important factors in designing a uniform or equipment for a soldier or a Spacesuit for Mars (NASA, pg. 43). At the very least we will incorporate separate modules/demos on NSRDEC's core competencies. Jo Ann Ross a fellow classmate, is developing a lesson plan on food packaging and recycling, As mentioned there are other modules/demos that have been developed by colleagues in the food area (designing an MRE) and airdrop (parachutes and glide ratios) which we hope to leverage, modify and adapt for our "soldier for a day" activity. Yet to be developed is a module/demo on shelters. The goal is to pull all the demos/modules together into a cohesive unit with a unified theme and make it fun, understandable and relatable to our student visitors.

It would be exciting to work with middle school teachers and incorporate a design challenge to be completed as a follow on classroom project. In the limited time available, I need to stay focused on top level information and not get "into the weeds" or I could lose the students' attention. The challenge is to highlight and focus on a few key points and show the relationships and interdependability between all NSRDEC's core competencies so students leave with the big picture and an understanding of how STEM used to protect our soldiers!

Justification

Currently, there is no structure to the tours that NSRDEC provides to middle school students. Implementing a "Soldier for a Day" activity will serve several functions: provide students with a better understanding of what NSRDEC does, provide insight into how STEM is used in developing products for soldiers, provide activities which integrate the science NSRDEC does into something the students can relate to and understand through engaging them in hands-on activities and provide project officers with guidelines to present their areas of expertise in a unified way which connects it all together for the student. Through first hand observations and experiences students will leave with a deeper understanding not only of the tradeoffs involved in engineering and designing clothing and equipment items but hopefully a deeper appreciation for our soldiers!

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