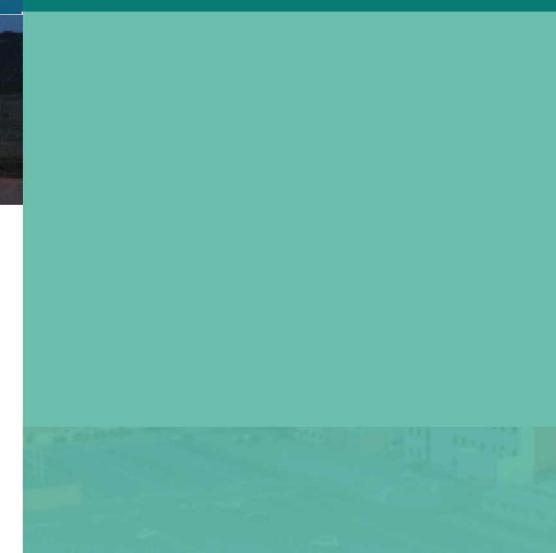
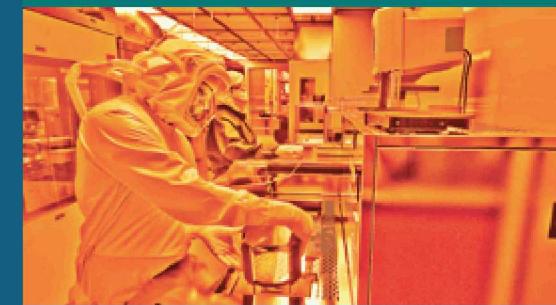
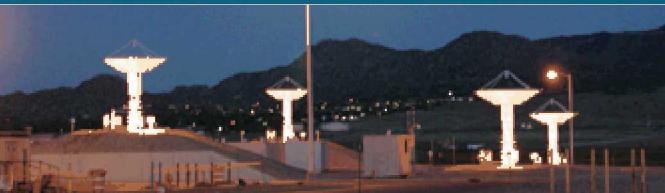


# Cognitive testing



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# Purpose

This document supports a Exploratory Express which is something like a late start LDRD

The purpose is to determine Cognitive bias

- People of low skills think that they are smarter than they are
- People of high skills think that are not as smart than they are
- Could their be personality effects –
  - You could be quick and intuitive
- It is a type of English grammar and logic task
- There are two parts to this experiment: NW logic and Over Claiming Effect
- All data must be UUR

NW logic

- Basic physics underlying NW
- Multiple choice question 4-5 answers
  - Want definitive answers
- Timed questions
- No open book no open notes
- Answer honestly
- Experiment time is 30 min
- 20-30 questions
- Range of difficulties

Over Claiming Effect

- List of 15 terms with 3 fake **terms**
  - Familiar, very familiar or not familiar

# Timeline

Analysis of the data

- 2 months

How many people

- ~75 people

Deployments

- 3-4 months

# NW Logic Multiple Choice Questions

## How does a Nuclear Weapon (NW) differ from a conventional bomb?

- a) Treaties require declaration of NW capability
- b) They must be carried on different platforms
- c) They are the same except for special nuclear material (SNM)
- d) Presidential authorization is required to use a NW

## What is the most important ‘Degree’ for NW?

- a) Nuclear Physics
- b) Chemistry
- c) Mathematics
- d) Engineering
- e) All of these are equally important



## What material is made in a reactor?

- a) Plutonium
- b) All of these
- c) Uranium
- d) Polonium

**MOU1** Are there any other materials that are made in a reactor? Maybe we can do Uranium & Plutonium as an answer (because we already know uranium and plutonium are made and since that's not an answer option, I know all of these must be the answer)

Microsoft Office User, 4/1/2020

**B2** The answer depends on the number of neutrons; eg the isotope or mass number. Most people think that uranium is mined - except for  $^{233}\text{U}$  which come from irradiating  $^{232}\text{Th}$  so the answer is all of them

Brad, 4/1/2020

# Who was the military lead of the Manhattan Project?

- a) Vanavar Bush
- b) Robert J. Oppenheimer
- c) **Leslie Groves**
- d) Franklin Roosevelt

MOU2  
B1

**MOU2** This one is super easy :). Is there a question that we could make about Bohr, Telles, ?Salazar?, Einstein, Ferme (not sure about that spelling) that we could ask who discovered what? I mean you can't do a NW without Bohr's model of the Atom. Ferme was instrumental in building the reactor. Einstein helped push the project forward through "political support." etc.

Microsoft Office User, 4/1/2020

**B1** Vanavar Bush was the head of the war department who hired groves...Oppie was a civilian at Berkeley and Roosevelt was president; in charge of the military. I can see your point as I thought it was overly tricky

Brad, 4/1/2020

Replacement for Military Lead question...

What did Albert Einstein do for the Manhattan project?

- a) Used his refrigeration patent as applied to keeping nuclear reactions cool
- b) Used his equivalence of mass and energy ideas to design a atomic weapon
- c) Used his prowess as arguably the most recognized scientist in the US to plea for the government to develop NW
- d) Taught nuclear physics to Manhattan Project engineers

## What was the single most important discovery in the development of NW?

- a) The fusion process in Stars
- b) Fission
- c) The Reactor
- d) The Neutron

MOU3

Haha I see you, Bohr! I like this. It is very open ended, but at the same time, you can't do ANYTHING without knowing about the Neutron.

Microsoft Office User, 4/1/2020

How many neutrons (on average) are given off by fission?

- a) 2.4
- b) 5.2
- c) 1.8
- d) Not enough information to answer the question
- e) 3.6



What material is the best for NW (fission only)?

- a)  $^{233}\text{U}$
- b)  $^{238}\text{Pu}$
- c)  $^{235}\text{U}$
- d)  $^{239}\text{Pu}$
- e)  $^{238}\text{U}$

**MOU5**

Do you think people familiar with the fuel cycle will know this?

Microsoft Office User, 4/1/2020

**B3**

This has nothing to do with the fuel cycle - it has to do with the cross-sections of the materials

Brad, 4/1/2020

## How do explosives (main charge) in NW differ from those in conventional bombs?

- a) NW explosives are safer
- b) NW explosives have more energy per molecule
- c) They are the same
- d) Conventional bomb explosives have more energy per molecule

**MOU4**

Ooh good one!

Microsoft Office User, 4/1/2020

## What are the main ingredients in a modern explosive?

- a) F,C,N,O
- b) C,H,N,O
- c) Ba,H,N,O
- d) Na,F,N,O
- e) Li,O,F,

## Which tail numbers are still in the stockpile?

- a) W76,W77,W78
- b) W86,W87,W88
- c) B61,B83,B90
- d) Mk4,Mk5,Mk12a
- e) W76,W87,W88

**MOU6**

Do you think your average NW engineer at Sandia would know this?

Microsoft Office User, 4/1/2020

**B4**

they better. the think that makes this tricky is the Mks - they are the cases for the NW, but they are all current

Brad, 4/1/2020

## What were the 3 'secret cities' formed for the Manhattan Project?

- a) Manhattan, Los Alamos, Albuquerque
- b) Manhattan, Oak Ridge, Wendover (Salt Lake City)
- c) **Hanford, Oak Ridge, Los Alamos**
- d) Hanford, Los Alamos, Amarillo

**MOU7**

Oh wow! Didn't know this.

Microsoft Office User, 4/1/2020

## What reaction releases the most energy per 'molecule/atom'

- a) Explosion/detonation
- b) **Fission**
- c) Fusion
- d) Combustion

**MOU8**

Hmm I think this might be more on the "common knowledge" side. At least that's what I think after reading the Field book on the history of the atom bomb and knowing his book about the hydrogen bomb.

Microsoft Office User, 4/1/2020

**B5**

We could make this trickier if we said per kilogram rather than per molecule - the answer would be Fusion

Brad, 4/1/2020

## What are the declared 5 NW states?

- a) US, UK, Russia, China, France
- b) Iran, China, North Korea, South Africa, Israel
- c) US, UK, China, South Africa, North Korea
- d) Japan, Sweden, Germany, UK, US

**MOU9**

Also did not know this!

Microsoft Office User, 4/1/2020

## Which answer is not a NW Free-Zone?

- a) Moon
- b) Antarctica
- c) All of these are free-zones
- d) Australia

**MOU10** Freezone being no NW?  
Microsoft Office User, 4/1/2020

**B6** Yes, good job!!! A free-zone is a place that no-one can put a NW  
Brad, 4/1/2020

## What is the difference between fast and slow neutrons?

- a) Nothing, they are neutral
- b) Fast neutrons enable NW, Slow neutrons enable Reactors
- c) Fast neutrons enable Reactors, Slow neutrons enable NW
- d) Fast neutrons must be reflected prior to absorption

## Who explained the energy balance of Fission?

- a) Hahn and Strassman
- b) **Lise Meitner**
- c) Robert Oppenheimer
- d) John Von Neumann

MOU11

This is good! A lot of people aren't good with names, so they'll use "recognition" of knowledge or their gut feeling of knowing to try and answer this question  
Microsoft Office User, 4/1/2020

## What is process the the DOE follows to update a NW?

- a) Lean Six Sigma
- b) POG process
- c) Acquisition
- d) 6.x

## What document regulates classification in NW?

- a) CG-W5
- b) DOE O-452
- c) 42 U.S.C.
- d) The Smyth Report

## What parameter(s) define critical mass?

- a) Mass
- b) Radius and density
- c) X-ray attenuation
- d) Neutron directionality

## Who owns US NW?

- a) POTUS
- b) SNL
- c) US Citizens
- d) DOE

**MOU12** Ahh this one is also tricky! I would have said POTUS  
Microsoft Office User, 4/1/2020

## What makes NW safe?

- a) Stronglinks and Weaklinks
- b) Walske Requirements
- c) ENDS
- d) All of these

**MOU13** The only concern with "all of the above" questions is if a person knows two or more answers, they can guess easily it is all of the above even if they don't know the third.

Microsoft Office User, 4/1/2020

Alternative Safety question...

Amongst all competing priorities, which one takes precedence?

- a) Security
- b) Use Control
- c) Reliability
- d) Safety
- e) Cost

## What makes NW Secure?

- a) Compartmentalization
- b) Segmentation
- c) Nothing
- d) **Guns, Gates and Guards**

## Who is the greatest proliferator of NW in modern history?

- a) Vladimir Putin
- b) A Q Khan
- c) Donald Trump
- d) Kim Jong-un

**MOU14**      Wow, what?!?! I need details at a later date.

Microsoft Office User, 4/1/2020

## What factor is key in determining the yield of a NW?

- a) The amount of SNM in the NW
- b) The ability to hold a specific target at risk
- c) The deterrence value of having a NW
- d) The accuracy of the NW system

## What is NIF (National Ignition Facility) trying to accomplish?

- a) Getting more energy out of a reaction than is put into it
- b) Scientific exploration supplanting the development of NW
- c) The development of clean energy
- d) Replacement of UGT for NW

## How many full scale NW Ipt safety tests have been conducted?

- a) More than 1 for each weapon system
- b) 12
- c) 65 (one for each weapon type fielded)
- d) 1



# Which words/phrases don't belong?

Nuclear Technology	Famous People (historical Figures) involved in NW
Fission	Robert J Oppenheimer
Secondary	Ghandi
Gas Priming	Leon Smith
Hardening	Richard Feynman
Bird Cage	Ronald Reagan
Cross section	Jason Robards
Electron cooling	Jane Fonda
Voltage inversion	Earnest Lawrence
Black body	Gordon Allott
Neutron disintegration	Robert Serber
Secondary Explosive	Henry Smyth
Staging	Norris Bradbury
Neutron focusing	Gene Roddenbury
Lensing	Harold Agnew
Reactor	Leslie Groves

**MOU15** He's too young!  
Microsoft Office User, 4/1/2020

**MOU17** Jason Robards (actor with a scientist-y name)  
Microsoft Office User, 4/1/2020

**B7** perfect - change it  
Brad, 4/1/2020

**MOU16** Good try, trying to get a famous dancer in there.  
Microsoft Office User, 4/1/2020

**MOU18** How about: Gordon Allott (R-CO). US senator from 1955-1973.  
Microsoft Office User, 4/1/2020

**B8** perfect change it  
Brad, 4/1/2020