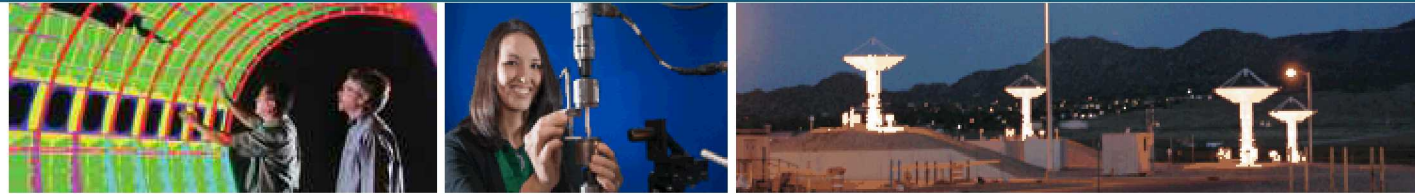




SAND2020-4113PE

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

Slide 7

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}U which come from irradiating ^{232}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

Slide 8

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

Slide 10

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}U
- b) ^{238}Pu
- c) ^{235}U
- d) ^{239}Pu
- e) ^{238}U

Slide 12

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

Slide 13

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

Slide 15

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

Slide 16

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

Slide 17

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

Slide 18

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

Slide 19

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

Slide 21

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

Slide 25

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

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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

Slide 29

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 |

Slide 34

- 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