What is the Synopsys Championship?

The Santa Clara County Science and Engineering Fair Since 1960!

Santa Clara Valley Science and Engineering Fair Association

Our Mission: To awaken more students to the wonder and powers of STEM!

Intel ISEF Affiliated Fair

Synopsys Championship

- Over 1000 Students
- 92 Schools
  - 50 Public
  - 42 Private
- 202 Teachers
- Students highly successful in subsequent fairs

Synopsys Championship

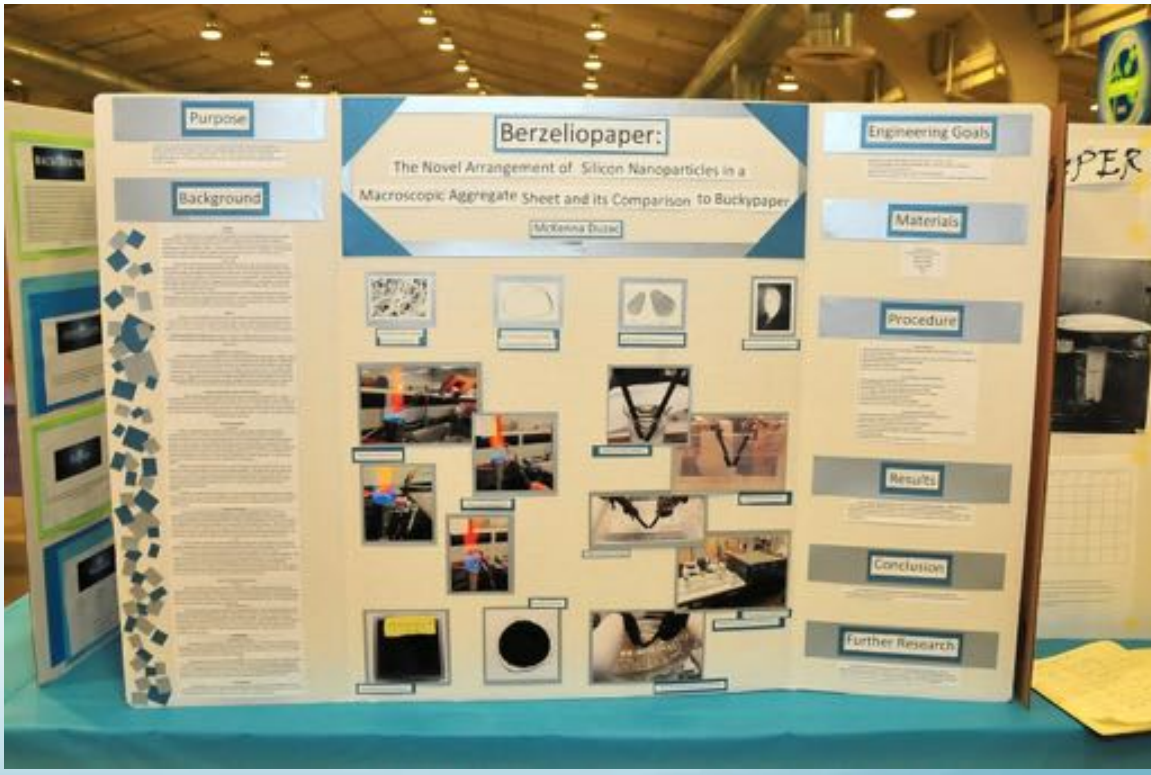
- www.science-fair.org
- Home page has “Latest News” + tabs
- Handbook
- Application forms
- Project status

Advantages of Participation

- Networking with other students!
- Discovery!
- Learning from mentors and judges
- Cash prizes up to $1000
- Trip to CA State Science Fair for grades 6-12
- Broadcom MASTERS for grades 6-8
- Trip to Intel International Science and Engineering Fair for grades 9-12
- NASA opportunities
- Variety of Special Awards from 60+ Orgs

Types of Projects

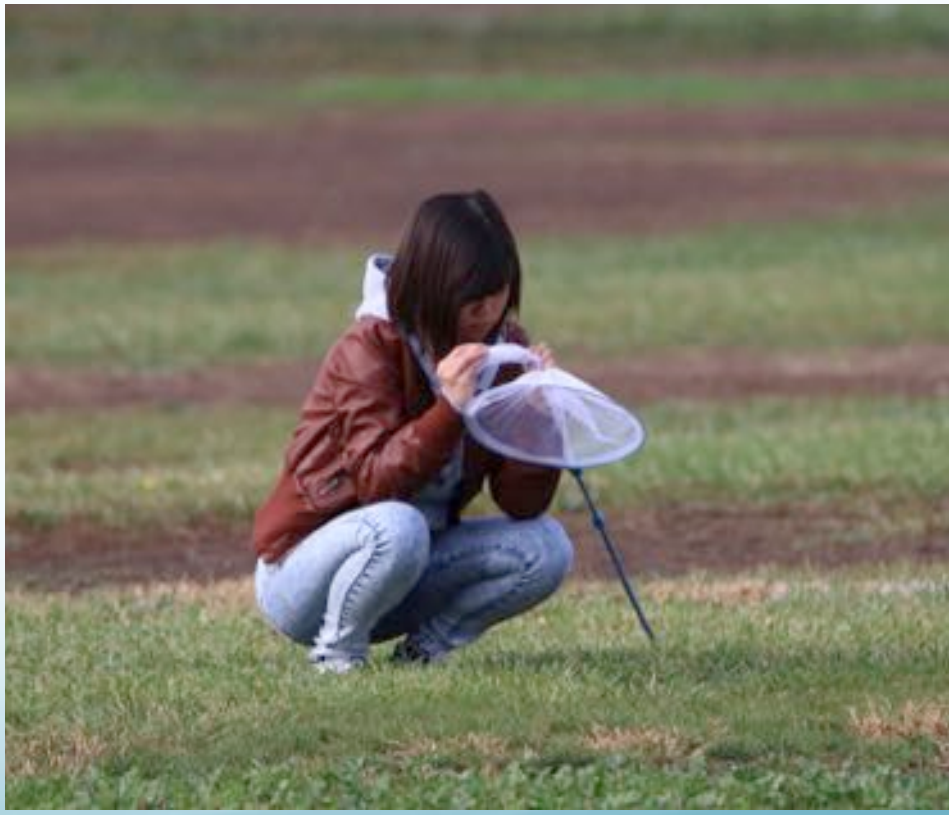
- Product testing for 8th and below ONLY
- Engineering, Math, Computer Science
- All types of Science Experiments
- See website for **Engineering** PPT



Getting Started

If the kids don't have **experience**, give it to them!

- Core experiments
  - Brine shrimp, paper circuitry
- Field trips
  - Can be real, virtual or created
- Read, read, read!
  - Look for parts of the experiments, hints at alternate experiments

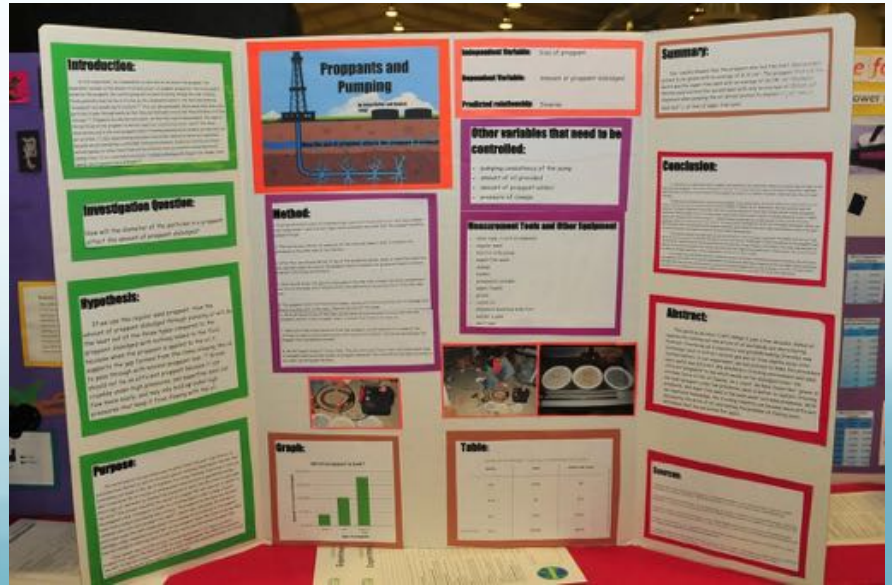


Use What They Know

- Hobbies
- Look around and SEE
- Things that BUG
- The Special Awards
- The News
- Unique measuring devices (UV meter)

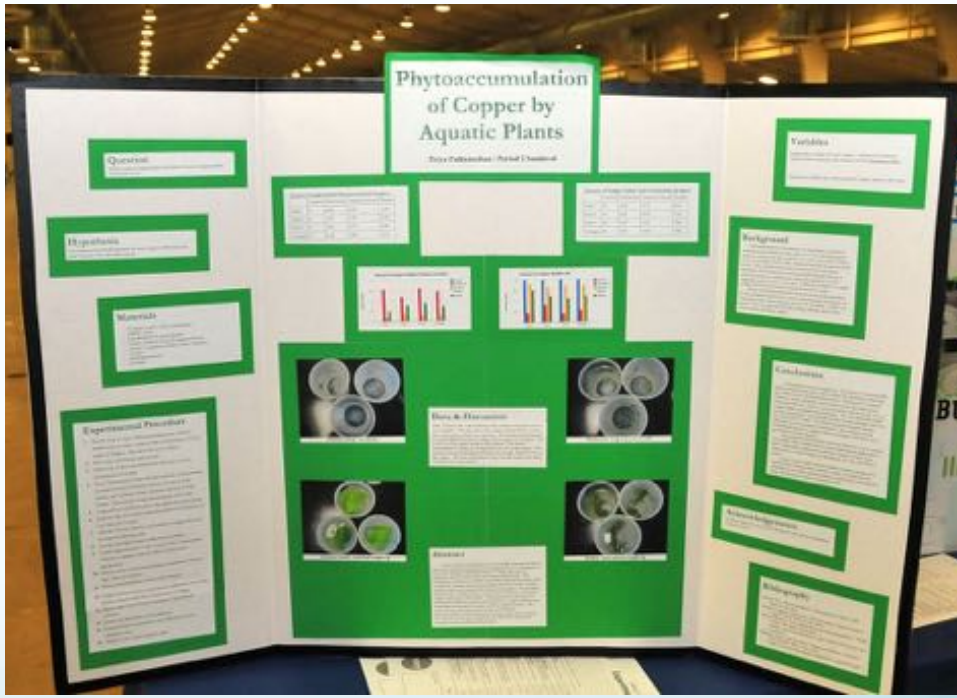
Projects Hints

- Something you CARE about
- Do your background research
- Look for the answer to Why or How
- Something that matters - to developing countries, to disabled people, to the environment
- The “inherently cool”



Stay away from:

- Pouring Coke on anything and everything
- Growing plants in different soils, additives, sound
- Testing different colors of light on plants
- Anything that starts out with “I want to find out what happens when…”
- See the “discouraged” list on the website



Need More Ideas?

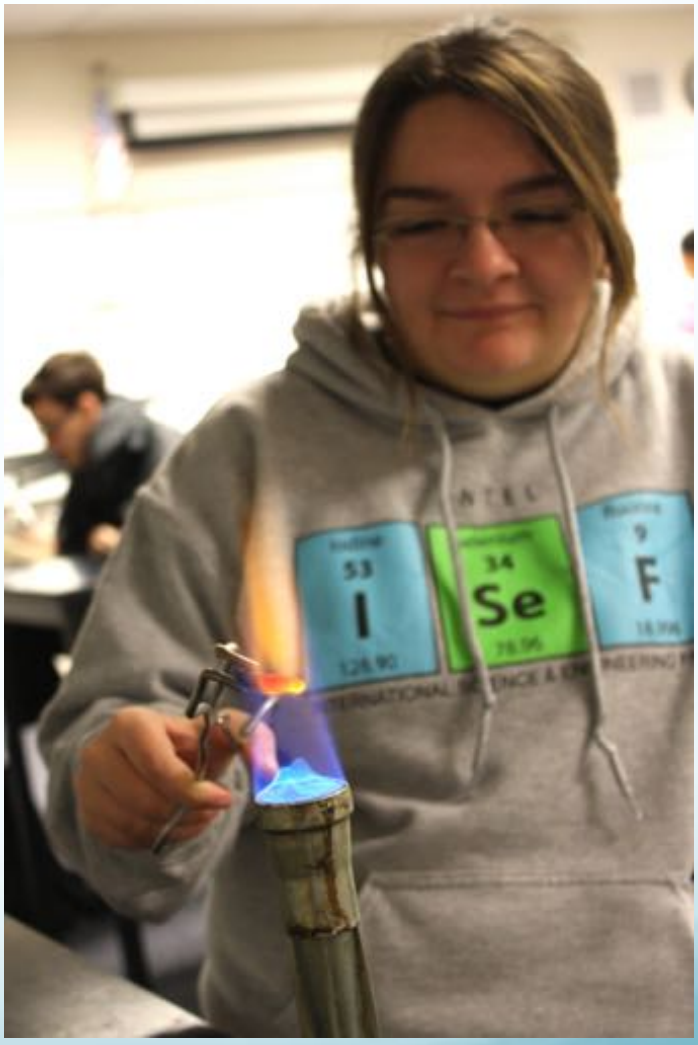
- Use Google and Google scholar
  - DO: Put in 2 science terms, “Earthquake” and “Magnetism”.
  - Or use ask.com. It offers nice suggestions.
  - Wikipedia is a good place to start but should not be used for final bibliography.
  - **Stay away** from science project lists
    - Exception- Science Buddies IF the student “Makes it their own”.
    - Science News for Students from Society for Science and the Public.

Success!

- Safety first
- Be data rich
  - Many samples
  - Repeated trials
  - Various conditions
- **Analyze** the data
- Be enthusiastic when presenting
- Parents: Know your place!
- Go beyond if using online resources.

Applying

- Check for deadlines
- Be clear
- Include safety information
- Use metrics
- Know your variables
- Check for all the special forms your project may require
- Answer **ALL** questions
- Signatures needed!
- All dates (except Form 1C) must be prior to experimentation.



Synopsys Championship

www.science-fair.org

- Download application – fill out, print and mail
  - On line application – must print & include Page 1
  - Supplemental application – Pgs 2-8
  - One final document – (1 of 4 research formats)
  - Additional forms – if SRC preapproval is needed

Application Cover – Page 1

- Contains demographic information from on line application
- Student selects Category and Field of study
  - Choose correctly for best experience!
  - Will recommend changes via email.
- This page must be printed and included with application
- When received the barcode is scanned and computer assigns the project #

Forms

All forms at

- https://student.societyforscience.org/intel-isef-forms
- https://science-fair.org/rules-and-registration/application-form-instructions/

- Be ready and keep track.
- Prevent a lot of back and forth emails requesting more information!
- New forms in 2017

What Type of Projects Need Pre Approval?

- **Vertebrates**
- **Humans**
- **PHBA** (bacteria etc.)
- **Chemicals**
- **Hazardous activities**
- **Hazardous devices**
- **Continuation projects**

- All require extra paperwork (more forms)
- Need approval to **START** experiment
- May need to adjust procedures or provide more details to be approved

Deadlines

- Early SRC review
  - 10/2/16
  - 10/30/16
- SRC deadline (all)
  - 11/23/16
- Final deadline for all non-SRC projects
  - 1/26/17

*** Postmark dates**

What's New this Year?

- Expanded definition of RRI
- Earlier SRC postmark deadline dates
- Middle school limits (30 projects per school)
- High school limits under consideration for future
- New SSP forms for some projects

Same as last year

- 4 categories with 15 fields of study
- Biomedical Engineering >>> Biological Sciences

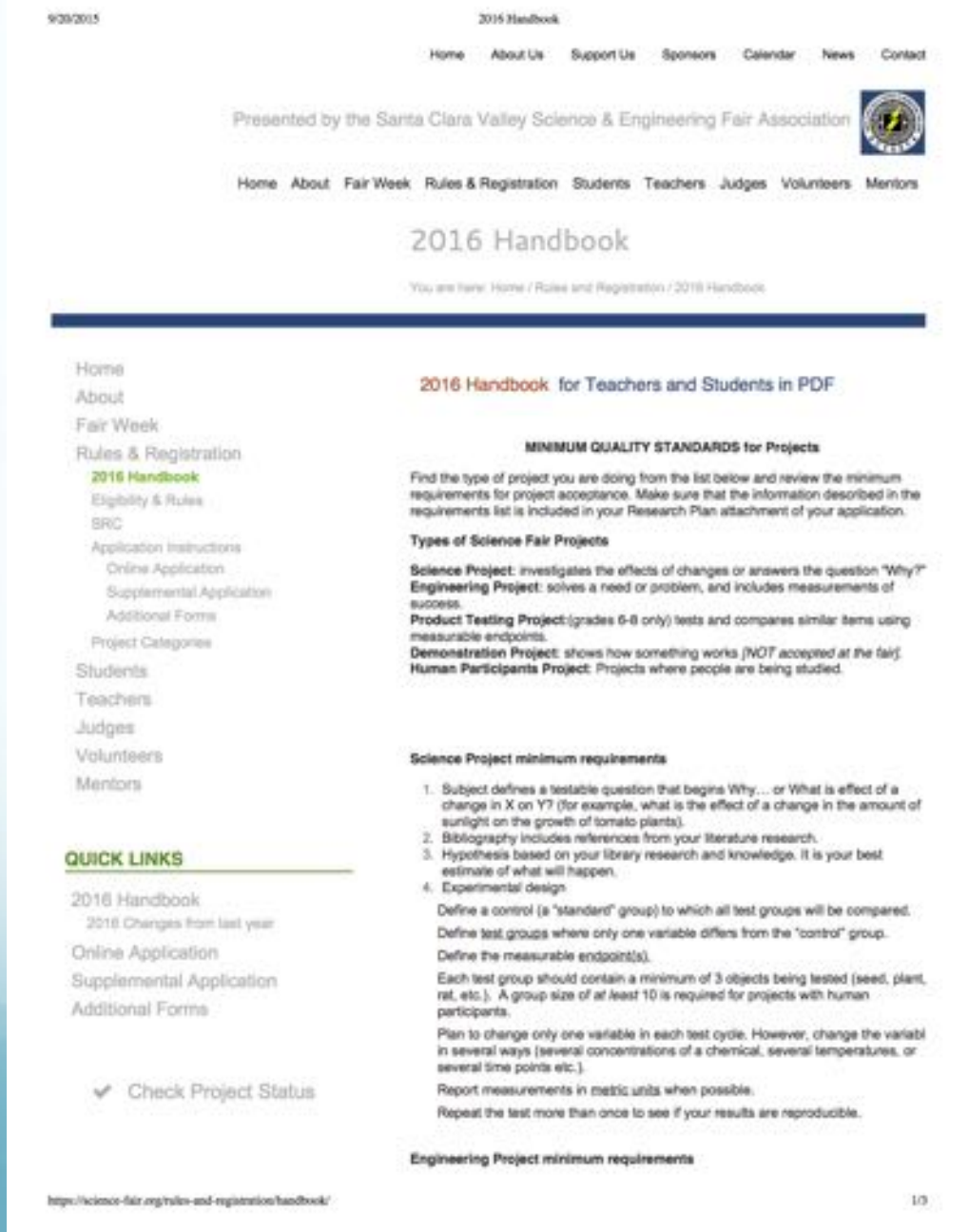
Expanded RRI Definition

- Research is conducted under the guidance of professional research staff from...
  - A Regulated Research Institution
  - A professional research staff at a company or government lab
  - With advice and guidance of a professional research scientist or engineer
  - Mentors, other than teachers, who provide substantial guidance, data or equipment not available in schools
- Judges will use Form 1C to figure out student contribution to the research.

More What's New this Year?

- Past - Incomplete projects>expect a note from the SRC
  - Ann (HS) or Mallika (MS)
- **Now:**
  - Human > Ann
  - PHBA (bacteria etc.) > Katy
  - Chemicals / Form 3 Issues > Holly
  - Engineering > TBD
- **Respond** to the person sending the note!
- See Contacts slide for emails
- No advice given for not meeting MQS (min quality standards)

Minimum Quality Standards (MQS)



9/20/2015 2016 Handbook

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Presented by the Santa Clara Valley Science & Engineering Fair Association

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2016 Handbook

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QUICK LINKS

2016 Handbook
2016 Changes from last year
Online Application
Supplemental Application
Additional Forms

Check Project Status

2016 Handbook for Teachers and Students in PDF

MINIMUM QUALITY STANDARDS for Projects

Find the type of project you are doing from the list below and review the minimum requirements for project acceptance. Make sure that the information described in the requirements list is included in your Research Plan attachment of your application.

Types of Science Fair Projects

Science Project: investigates the effects of changes or answers the question "Why?"
Engineering Project: solves a need or problem, and includes measurements of success.
Product Testing Project:(grades 6-8 only) tests and compares similar items using measurable endpoints.
Demonstration Project: shows how something works *[NOT accepted at the fair]*.
Human Participants Project: Projects where people are being studied.

Science Project minimum requirements

1. Subject defines a testable question that begins Why… or What is effect of a change in X on Y? (for example, what is the effect of a change in the amount of sunlight on the growth of tomato plants).
2. Bibliography includes references from your literature research.
3. Hypothesis based on your library research and knowledge. It is your best estimate of what will happen.
4. Experimental design

Define a control (a "standard" group) to which all test groups will be compared.

Define test groups where only one variable differs from the "control" group.

Define the measurable endpoint(s).

Each test group should contain a minimum of 3 objects being tested (seed, plant, rat, etc.). A group size of *at least* 10 is required for projects with human participants.

Plan to change only one variable in each test cycle. However, change the variabl in several ways (several concentrations of a chemical, several temperatures, or several time points etc.).

Report measurements in metric units when possible.

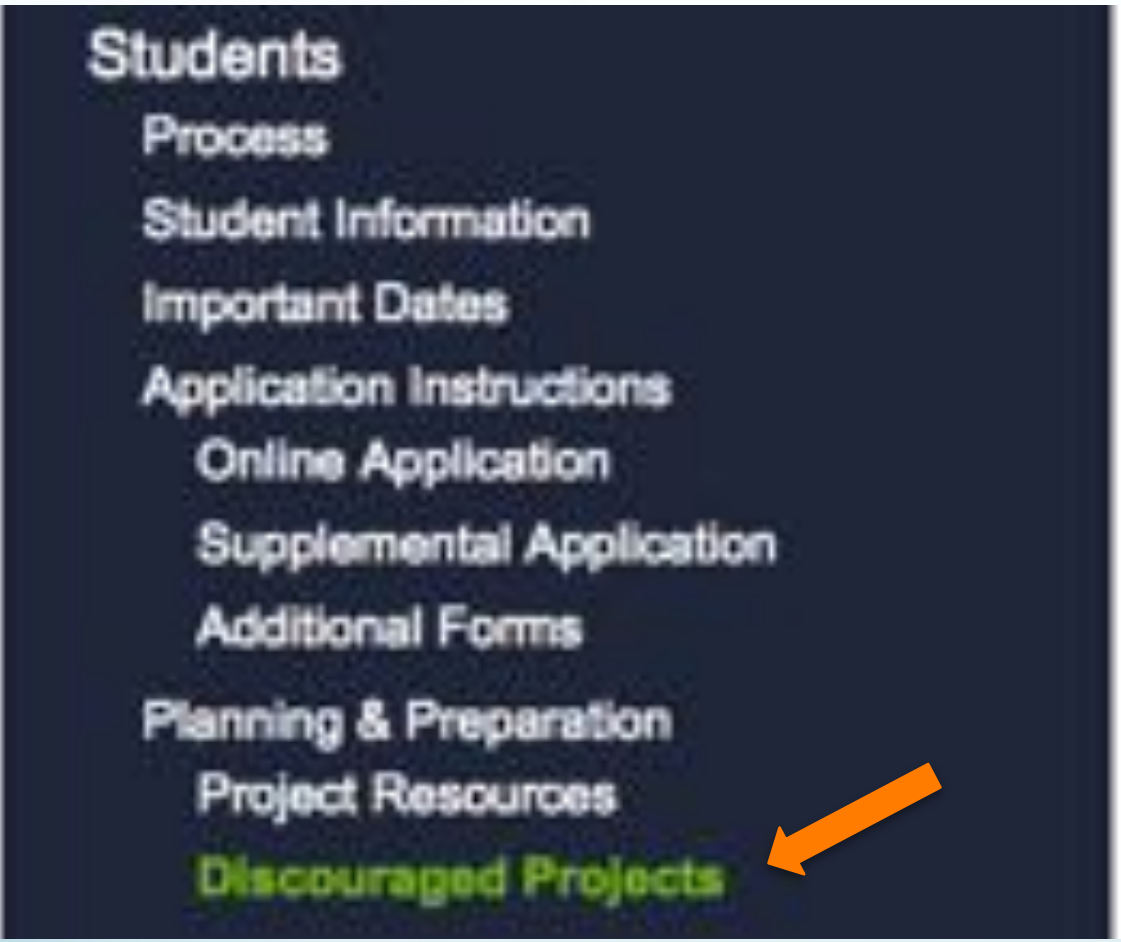
Repeat the test more than once to see if your results are reproducible.

Engineering Project minimum requirements

https://science-fair.org/rules-and-registration/handbook/ 1/3

- Handbook
- Different MQS for different projects
- Teachers responsible
- https://science-fair.org/rules-and-registration/handbook/

Discouraged Projects Link



variables included)
2. Crystal growth (OK at mic
3. Effect of cola, coffee, etc.
4. Effect of music, video gar
people per group)
5. Strength/absorbency of p
6. Most consumer product te
7. Astrology projects
8. Maze running (unless the
9. Any project that boils dow
10. Effect of color on taste.
11. Optical Illusions
12. Reaction Times (OK with
13. Planaria worm regenerati
14. Detergents vs. Stains (OK
15. Basic solar collectors or c

https://science-fair.org/students-parents/discouraged-projects/

SCIENCE FAIR PROJECTS

- Science Research Project
- Product Testing Project
- Engineering Project
- Human Participant Project

✧ No demonstration projects will be accepted (i.e. how things work)

Science Research Project - MQS

- Testable Question (Why or what is the effect of…)
- Bibliography
- Hypothesis (Based on the literature search)
- Experimental Procedure
  - Quantitative Endpoint Measurement (metric units)
  - Control – To compare your test against
  - Variables – How are they being changed

List the following:

- Independent and Dependent Variables
- Controlled Variables or Constants
  - Positive control
  - Negative control
- #Subjects in a test group
  - A minimum of 3 tests is required, more is better
  - At least 10 human participants per test group
- #Experimental Repetitions
  - Repeat more than once, 3+ preferred
  - More if data is erratic

Product Testing Project - MQS

- Product Testing Project vs Science Research Project
  - Variable not changed in multiple ways
- Same MQS as Science Research Projects
- Grades 6 & 7 – Minimum of 3 test groups or products
- Grade 8 – Minimum of 4 test groups or products

Engineering Project – MQS

- Define Problem/Need
- Bibliography
- Engineering Design (Diagrams & Description)
  - Design Criteria ** often missing
  - Design Constraints
- Define Success Criteria
- Measurements (metric units)

Human Participant Project - MQS

- Science Research Project
- MQS as in Science Research Projects and more
- Minimum of 10 human participants per test group
- **Forms**
  - Human Subjects Detailed Research Plan
  - Sample Test sheet
  - Sample Informed Consent
- https://student.societyforscience.org/intel-isef-forms

Research Involving Human Participants

Reviewed according to principles in the Belmont Report, "Ethical Principles and Guidelines for the Protection of Human Subjects of Research" - The National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research (1979).

Guiding principles

- Respect for Persons
- Beneficence
- Justice

Participants

Describe characteristics of people you want to study:

- How many? Usually minimum 10/group
- Ages? Groups or continuous?
- Gender(s)?
- Other specific identifiers…?

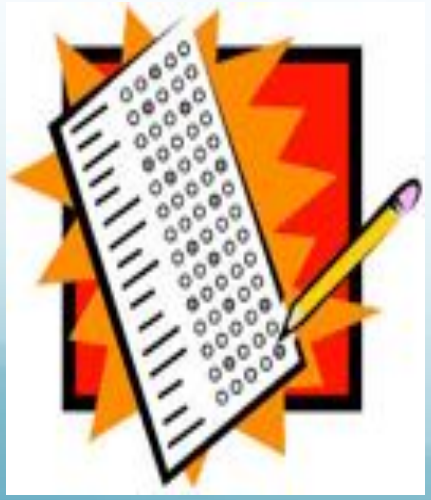
Recruitment

- How will you identify your participants?
- How will you invite them into your study?
- If young children, there should be teachers & parents involved.
- Is recruitment random (whomever volunteers) or focused (reach out to specific groups or individuals)?
- Where and how will recruitment occur?

Methods

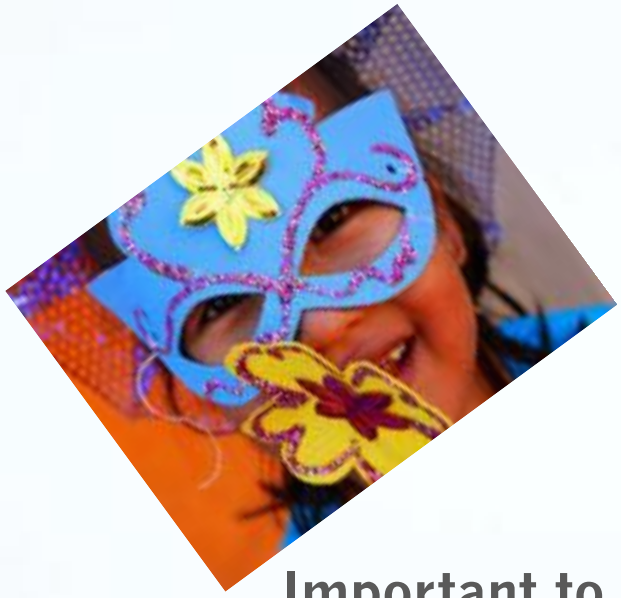
Provide detailed description of procedures:

- What will each person be expected to do?
- How long is the participation?
- What will be measured/tested?
- What instruments will be used?



Provide SRC with all surveys, tests, questionnaires, etc. that will be used.

✓ *It is essential for the IRB to preview materials.*



Confidentiality

Important to protect private information

- Do you need to collect identifiable data?
- Always be respectful – human research requires trust
- Do not use any personal information in your reports

Risks & Benefits

Consider and describe all possible risks:

- Physical
- Psychological
- Social / Emotional
- What are you doing to ensure safety?

Are there any benefits to participating?

- Usually ‘none’ to the individual
- “Greater good” to society…
- NOT about the student researcher!
- Consider Risk-Benefit Ratio

Data Analysis

Data collection - based on hypothesis!

- What information will you collect?
- How will you organize it?
- How will you analyze it?

Plan ahead! Don't just gather information and assume the patterns will emerge...

✓ *Use sample spreadsheets*

✓ *Simple math may be enough*

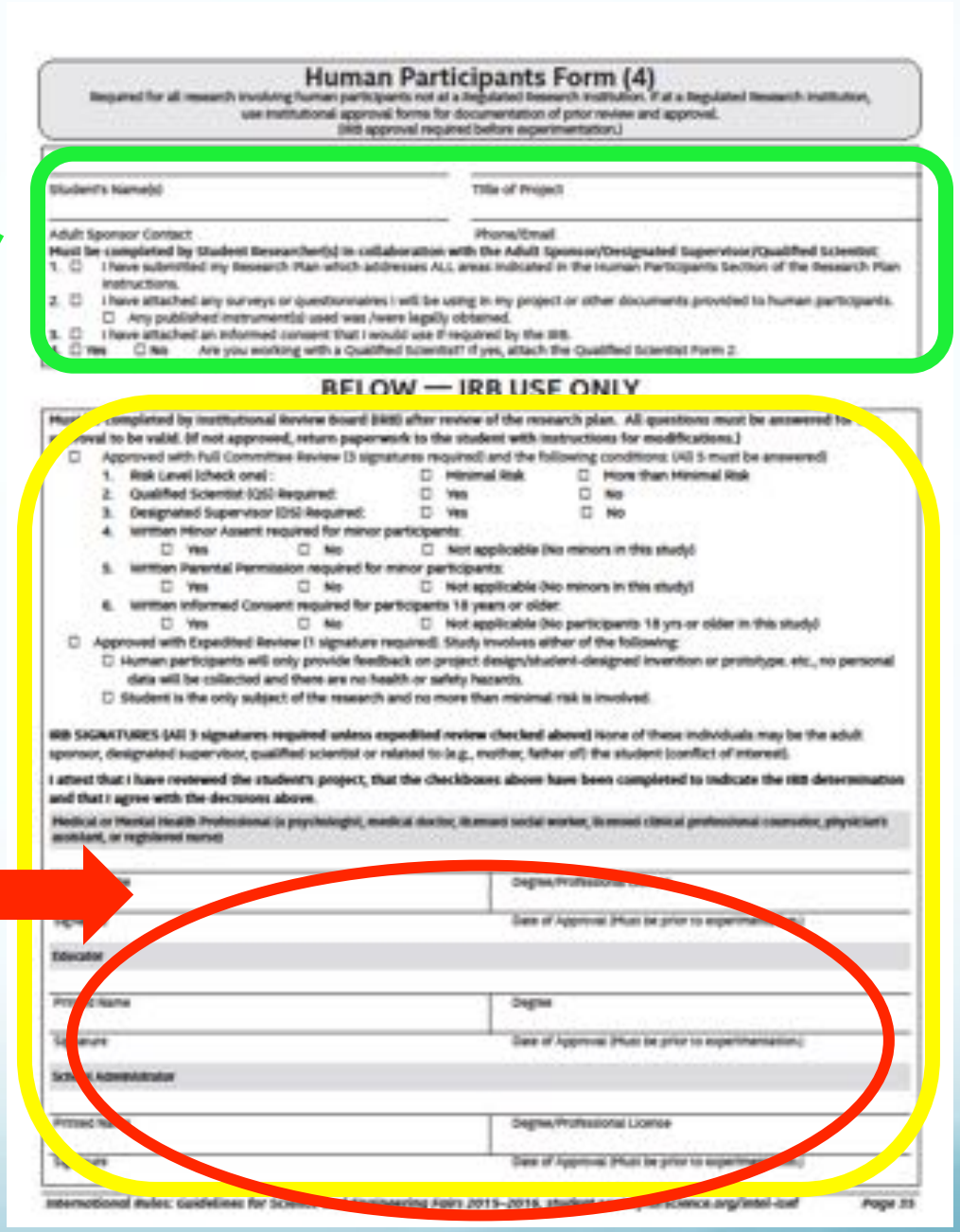
Form 4

Student completes top section only

IRB completes and signs

NO signatures on bottom third section!!

Student brings signed Form 4 to check-in



Human Participants Form (4)

Required for all research involving human participants not at a Regulated Research Institution. If at a Regulated Research Institution, use institutional approval forms for documentation of prior review and approval. (IRB approval required before experimentation.)

Student's Name(s) | Title of Project

Adult Sponsor Contact | Phone/Email

Must be completed by Student Researcher(s) in collaboration with the Adult Sponsor/Designated Supervisor/Qualified Scientist

1. ☐ I have submitted my Research Plan which addresses ALL areas indicated in the Human Participants Section of the Research Plan instructions.
2. ☐ I have attached any surveys or questionnaires I will be using in my project or other documents provided to human participants.
   ☐ Any published instrument(s) used was /were legally obtained.
3. ☐ I have attached an informed consent that I would use if required by the IRB.
4. ☐ Yes ☐ No Are you working with a Qualified Scientist? If yes, attach the Qualified Scientist Form 2.

BELOW — IRB USE ONLY

completed by Institutional Review Board (IRB) after review of the research plan. All questions must be answered for approval to be valid. (If not approved, return paperwork to the student with instructions for modifications.)

☐ Approved with Full Committee Review (3 signatures required) and the following conditions: (All 5 must be answered)

1. Risk Level (check one): ☐ Minimal Risk ☐ More than Minimal Risk
2. Qualified Scientist (QS) Required: ☐ Yes ☐ No
3. Designated Supervisor (DS) Required: ☐ Yes ☐ No
4. Written Minor Assent required for minor participants: ☐ Yes ☐ No ☐ Not applicable (No minors in this study)
5. Written Parental Permission required for minor participants: ☐ Yes ☐ No ☐ Not applicable (No minors in this study)
6. Written Informed Consent required for participants 18 years or older: ☐ Yes ☐ No ☐ Not applicable (No participants 18 yrs or older in this study)

☐ Approved with Expedited Review (1 signature required). Study involves either of the following:

☐ Human participants will only provide feedback on project design/student-designed invention or prototype, etc., no personal data will be collected and there are no health or safety hazards.

☐ Student is the only subject of the research and no more than minimal risk is involved.

IRB SIGNATURES (All 3 signatures required unless expedited review checked above) None of these individuals may be the adult sponsor, designated supervisor, qualified scientist or related to (e.g., mother, father of) the student (conflict of interest).

I attest that I have reviewed the student's project, that the checkboxes above have been completed to indicate the IRB determination and that I agree with the decisions above.

Medical or Mental Health Professional (a psychologist, medical doctor, licensed social worker, licensed clinical professional counselor, physician's assistant, or registered nurse)

Printed Name | Degree/Professional License

Signature | Date of Approval (Must be prior to experimentation.)

Educator

Printed Name | Degree

Signature | Date of Approval (Must be prior to experimentation.)

School Administrator

Printed Name | Degree/Professional License

Signature | Date of Approval (Must be prior to experimentation.)

International Rules: Guidelines for Science and Engineering Fairs 2015–2016. student...science.org/intel-isef Page 33

Informed Consent Form (ICF)

Required sections:

- Explain purpose of your study
- What is expected of study participants (procedures), including frequency & duration
- Risks – physical, psychological, social
- Benefits (if any)
- Participation is voluntary
- Encourage questions
- Sign ICF – **after** *the conversation*

Review Process

SRC/IRB meets and reviews submissions

- ✓ All required forms included?
- ✓ All information provided?
- ✓ Procedures safe and appropriate?
- ✓ Measurement tools appropriate?
- ✓ Informed consent form attached?
- ❖ Questions are referred back to student
- ❖ IRB reviews responses from student

Final approval > Project can begin!

Vertebrate Animals

- From fish, lizards and birds to cats and gorillas
- Pure observation is OK
- Very complex rules – contact src@science-fair.org
- Pets become experimental animals
- Projects involving pain are **FTQ** (fail to qualify).
- Projects involving death as the end point are **FTQ**.
- Students may not euthanize lab animals.

Potentially Hazardous Biological Agents (PHBA)

- Microorganisms
- Recombinant DNA
- Human or animal fresh tissues
- Blood or body fluids
- **Safety** dictates SRC pre-approval
- Can't be done at home
- No multiple antibiotic resistance
- BSL-3 and 4 > **FTQ**

PHBA Exempt

- Studies using baker's and brewer's yeast (except rDNA studies)
- Most studies involving protists, archae and similar microorganisms
- Composting and fuel production studies
- Studies using *Lactobacillus*, *B. thuringiensis*, nitrogen-fixing bacteria, oil-eating bacteria and algae-eating bacteria in natural environment

Potentially Hazardous Biological Agents

Forms

- Application!
- 1 – Adult Checklist (teacher should be Sponsor)
- 1A – Student Checklist
- 1B – Approval Form
- 1C – Institution (if applicable, return at check-in)
- 2 – Qualified Scientist in applicable field
- 3 – Risk Assessment (always good)
- 6A – PHBA Risk Assessment Form
- 6B – Tissues & Body Fluids (if applicable)
- Research Plan – details, how much of what type and when

Potentially Hazardous Biological Agents

Form 1C - Institution

- Supervising adult needs to be on staff at the university and have supervisory role in the lab where the work is conducted.
- PI **must** be aware of minor being in lab and student **always** supervised.
- Postdocs – OK
- Grad and Undergrad students – Not OK
- If work is subset of PI's work – OK
- If work is not a subset of PI's work, PI would need to obtain separate SRC/IRB approval from host institution.

Potentially Hazardous Biological Agents

Form 2 – Qualified Scientist

- The lead adult in Form 1C.
- Experience (PhD preferred), position
- Designated supervisor can be someone equal or lower on the totem pole but they should be aware of all safety and hazards and equipment use.

Potentially Hazardous Biological Agents

Form 6A – PHBA Risk Assessment

- Biosafety levels
  - Center for Disease Control (CDC)
    http://www.cdc.gov/training/QuickLearns/biosafety/
  - American Biological Safety Association
    http://www.absa.org/resbslinks.html - bioguides
- Personal protective equipment (PPE)
  - Labcoat
  - Gloves
  - Goggles
  - Appropriate to actual use!
- **Disposal**

Potentially Hazardous Biological Agents

BSL-1

- Microbes are **not known** to **consistently** cause disease in **healthy** adults and present minimal **potential** hazard to people and environment
- Culture in dish in laboratory. Dispose properly!
- Environmental sources are BSL-2 unless cultured in sealed dish. May not be opened.
- Dispose properly!

Potentially Hazardous Biological Agents BSL-1

- Microbes are not known to consistently cause disease in healthy adults and present minimal potential hazard to people and environment
- Example: nonpathogenic strains of *E. coli*
- Follow standard microbiological practices
- Can use open lab bench or table
- Personal protective equipment (PPE) as needed
- Sink available
- Door to separate work areas

Potentially Hazardous Biological Agents

BSL-2

- Microbes pose **moderate** hazards to people and environment.
- Microbes are typically indigenous
- Associated with disease of varying severity
- Example: *Staphylococcus aureus*
- Restricted access
- PPE may include face shields
- Biological safety cabinet for infection, aerosols and splashes
- Autoclave decontamination and proper disposal
- Self closing doors
- Sink and eyewash stations nearby

Potentially Hazardous Biological Agents

BSL-3 and 4
NOT ALLOWED

- BSL-3
  - Indigenous or exotic microbes
  - Serious or lethal disease through respiratory transmission
  - Example: *Mycobacterium tuberculosis*
- BSL-4
  - Very small number of labs around the world
  - Dangerous and exotic
  - High risk, fatal, no treatment
  - Example: Ebola

Potentially Hazardous Biological Agents

Form 6A – continued

- BSL determination – safe rather than sorry
- Quantity and sources
- Site, facilities and biological containment
- PPEs, training, etc.
- Disposal – just saying some company will take care of it is ok but not great. You should always know the danger of what you are working with and how to take care of emergency situations and disposals.
- Universities will require safety training
- Teacher **must** have appropriate training

Risk Assessment Form 3 (i)

- Use for exempt microorganisms
- Use for chemicals
- Use for radiation (ionizing, UV, other)
- Hazardous devices (firearms, vehicles)
- Hazardous activities (fire, explosions, high elevations, dangerous traffic, etc.)
- Engineers using people to test inventions should assess the risk using Form 3.

Risk Assessment Form 3 (ii)

- Form is very specific and explicit
- Chemicals – What? Concentration? Volume?
- “n/a” is not acceptable
- What safety equipment?
- How disposed?

Risk Assessment Form 3 (iii)

- Signature is very important.
- Must be signed by person supervising the experiment and she/he **must** have relevant expertise.

Contacts

- General <src@science-fair.org>
- Ann Burrell <adburrell@usa.net>
- Heidi Black <blackh@esuhsd.org>
- Mallika Srinivasan <mallika1117@yahoo.com>
- Jenny Kiratli <jenny.kiratli@va.gov>
- Katy Korsmeyer <katykorsmeyer@gmail.com>
- Holly Denton <hollygg@earthlink.net>

Resources

- General
  - www.science-fair.org
  - http://www.societyforscience.org/ISEF/
- Projects
  - https://science-fair.org/students-parents/discouraged-projects
  - www.sciencebuddies.org
  - http://school.discoveryeducation.com/sciencefaircentral/
  - http://ei.cornell.edu/student/
  - https://student.societyforscience.org/sciencenews-students

Safety Resources

- Belmont Report on human subjects
  - http://www.hhs.gov/ohrp/humansubjects/guidance/belmont.html
- Biosafety levels
  - http://www.cdc.gov/training/QuickLearns/biosafety/
- Santa Clara County Waste Disposal Program
  - https://www.sccgov.org/sites/rwr/hhw/Pages/Conditionally-Exempt-Small-Quantity-Generator-Disposal-Program.aspx
- CA Dept of Ed Science Safety Handbook
  - http://www.cde.ca.gov/pd/ca/sc/documents/scisafebook2014.pdf
- EPA Resources for School Chemicals
  - https://www.epa.gov/schools-chemicals/schools-resources-safe-chemical-management
- SCU's chemical safety data sheet search
  - https://cisprolive1.chemswlive.com/CISPro/login_msds.asp?accessid=2296#

See You at the Fair!