

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"



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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".
 - <u>Science News for Students</u> 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.

Application

- 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 #



All forms at

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

What's New this Year?

- Expanded definition of RRI (grades 9-12)
- Earlier SRC postmark deadline dates
- Middle school limits (30 projects per school)
- Championship dates are one week later this year.
- New SSP forms for some projects

Same as last year

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

Expanded RRI Definition Gr 9-12 only

- 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 determine student's contribution to the research.

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



More What's New this Year?

- Past Incomplete projects>expect a note from the SRC
 - Ann (HS) or Mallika (MS)

• Now:

- Human > Ann (adburrell@usa.net)
- PHBA (bacteria etc.) > Katy (<u>katykorsmeyer@gmail.com</u>)
- Chemicals / Form 3 Issues > Holly (hollygg@earthlink.net)
- Engineering > Karen (kgb@rahul.net)
- **Respond** to the person sending the note!
- See Contacts slide for emails
- No advice given for not meeting MQS (min quality standards – check MQS and resubmit)

Middle School Project Limits

- Teacher project limits are same as previously
 - 5 projects for new teachers
 - 5 projects for teachers with no Category winners last year
 - 10 projects for teachers with 1-2 category winners
 - 15 projects for teachers with 3+ category winners
- A new teacher may request 10 projects if meet 1 on 1 with SRC member before SRC review.
- NEW All middle schools have a 30 project limit.
- Parent Sponsored Projects (PSP) permitted at middle school IF no teacher at school or grade not supported.

Minimum Quality Standards (MQS)

9/39/2015

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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Eligibility & Rules SRIC Application Instructions Online Application Supplemental Application

Additional Forms

Project Categories

Students

Teachers

Judges

Volunteer

Mentors

QUICK LINKS

2016 Handbook 2016 Charges 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

- 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 sunight on the growth of formato plants).
- 2. Bibliography includes references from your iterature research.
- 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 variable 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.

- Handbook
- Page 6 of application
- Different MQS for different projects
- Teachers responsible

<u>https://science-fair.org/rules-and-registration/handbook/</u>

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Discouraged Projects Link

Students Process Student Information Important Dates Application Instructions Online Application Supplemental Application Additional Forms Planning & Preparation **Project Resources Discouraged Projects**

variables included)

- 2. Crystal growth (OK at mic
- 3. Effect of cola, coffee, etc.
- Effect of music, video gar people per group)
- 5. Strength/absorbency of p
- 6. Most consumer product to
- 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 (OF
- 15. Basic solar collectors or c

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

Project Research Protocols

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

MQS Product Testing Project

- 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

MQS Engineering Project

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

MQS Human Participant Project

- 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
- <u>https://student.societyforscience.org/intel-isef-forms</u>

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) Imparts for all research involving furnaes participants not at a hegulated beauerch institution, use institutional approval comes for documentation of prior neview and approval. (Bit approval regional before any experimentation.)		
Audent's Name(d	Title of Project	
dult Sponsor Contact Weil Be sampleted by Student Researcher(s) is calla C I have submitted my Research Han which add instructions. I have sitalched any surveys or questionnaires. Any published instrumental used was /we I have sitalched as informed consert that I wo O nee C ha Are you working with a Qualifie	Phone/Omail doration with the Adult Sponsov/Decignated Supervisor/Qualified Extension research.c. areas indicated in the reunan Participants Section of the Besauch Pla 1 will be using in my project or other documents provided to human participants are lapity obtained, out use if required by the IBS. ad Scientist' if yes, attach the Qualified Scientist Form 2.	
BELO	W - IRB USE ONLY	
Approved with Full Committee Review D signs Approved with Expected Consent required for minor p Yes Yes Approved with Expected Review II signature in Approved with Expected Review II signature in Statement Percental Consent required for p Yes Settement in the only subject of the research is Statement in the only subject of the research is Statement Statements Review II signature in Approved with Expected Review II signature in Statement Statements required for a subject of the research is Statement Statements required index are in the subject of the research is Statement Statements required unless experiment, designated supervises, required and so are private for the research is Statement Have reviewed the statement project, that if hart a genew with the decreases above. Yes	Insist to the student with instructions for modifications.] Intens required) and the following conditions: (AI 5 must be answered) Phinimal Risk Phinimal R	
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Informed Consent Form (ICF)

Required sections:

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



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@sciencefair.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 preapproval
- 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, oileating bacteria and algae-eating bacteria in natural environment

Potentially Hazardous Biological Agents Forms

- Application! Page 1 needed
- 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

PHBA 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.
- Pl 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.

PHBA 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.





Form 6A – PHBA Risk Assessment

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

• Disposal



PHBA Biosafety Levels 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!

PHBA Biosafety Levels 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

PHBA Biosafety Levels 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

PHBA Biosafety Levels 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

PHBA 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.)
- Students using people to test engineering 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.
- Teachers cannot sign Form 3 if project not done at school
- Date precedes experimentation

Contacts

- General <src@science-fair.org>
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- Katy Korsmeyer <katykorsmeyer@gmail.com>
- Holly Denton <<u>hollygg@earthlink.net</u>>
- Karen Gundy-Burlet <kgb@rahul.net>

Resources

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

See You at the Fair!

