CUSD

Science Fair Handbook

♦♦HISEF 2016: February 27♦♦

This handbook was designed by CUSD teachers for CUSD teachers!

The intent of this handbook is to provide answers to common questions asked regarding your site science fair as well as the district science fair (HISEF). This handbook will provide continuity across grade levels and streamline the science fair process.

Handbook Objectives:

- To explain district expectations for site science fair & classroom science experiments
- To provide the teacher a reference for science fair questions
- To guide you through the Institutional Review Board (IRB)
- To give instructions for submitting student projects to your site fair and HISEF
- To suggest ways to integrate science curriculum into your daily science practices

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Chandler Unified School District

The CUSD Science Fair Handbook is updated annually by science cadre members.

Who participates in Science Fair?

Site Fairs:

Each CUSD school will hold a science fair. The date is to be determined by the individual site (with all Elementary and Jr. High fairs being completed before HISEF). Science Cadre members will serve as the site coordinator for the fair.

Participants:

Students in grades K – 8 will participate in science fair. Participation will vary at grade levels as described below.

Grades K - 3
Develop a class project based on grade level curriculum with the assistance of their teacher and mentors to be displayed at site fairs.

4th Graders
Develop a science fair project based on grade level curriculum with display board for site fair individually or in teams of **2-3**.

5th Graders
Develop a science fair project for eligibility at HISEF. Projects must be based on grade level curriculum with display board for site fair and eligibility for HISEF. May work individually or in teams of **2-3**.

6th Graders
May choose a science fair project based on grade level curriculum. May work individually or in teams of **2-3**. An abstract should be included.

7th and 8th Graders
May choose a project based on grade level curriculum and within one of the following categories: Animal Science, Behavioral & Social Science, Cellular & Molecular, Chemistry, Computer Science, Earth & Planetary Science, Engineering, Environmental Sciences, Mathematical Sciences, Physics & Astronomy, and Plant Sciences. May work individually or in teams of **2-3**.
An abstract should be included.

High School
Projects are research-based

Eligibility for HISEF:

- A total of six (6) 5th grade projects may be chosen to enter HISEF per site.
- A total of six (6) 6th grade projects may be chosen to enter HISEF per site.
- A total of five (5) 7th and 8th grade projects per category (see above) may be chosen to enter HISEF per site. (This number cannot exceed 40).
- High School Projects are judged the Friday before HISEF. Contact Debbie Nipar at HHS for further information.

Aligning to the Curriculum:

Projects should be aligned to the CUSD curriculum. This would include invention projects.

Where should projects be done?

The grade level determines where it is appropriate for a project to be completed.

K-6	7-8	High School
All projects must align to grade level curriculum and all components (planning, experimenting, research, report writing/typing, and board creation) must be completed in the classroom. Projects could require IRB approval. These projects must be approved before starting.	Projects must align to the grade level curriculum. Experiments may be conducted at home (parents must be notified of all safety expectations/ procedures) as well as typing reports. All other aspects of the project, including construction of the board *must* be done at school. Projects could require IRB approval. These projects must be approved before starting.	Projects may be done in school, at home, or at an independent research facility. SRC approval is required for all research conducted in an independent research facility. Projects could require IRB approval. These projects must be approved before starting.

What are the expectations for curriculum alignment?

All projects must align to their grade-level curriculum. **This alignment ensures that the science fair projects do not become additional work, but compliment the on-going science curriculum.** Curriculum Alignment Forms can be found on the CUSD website and are required for projects K-8th grade. This form will be placed on the back of every project. All science inquiry projects should include: question, hypothesis, material and procedures, data/results, conclusion/future research. Abstracts are required for the 6th -12th grade. Curriculum alignment forms are found on the CUSD science curriculum webpage under Science Fair.

Are you being safe?

The CUSD Safety Guidelines and CUSD Risk Assessment Matrix must be followed to ensure a safe environment, minimize potential risks, and take into consideration overall safety for students, staff, and property. The Project/Lab Flowchart located on the CUSD science curriculum webpage will guide teachers and students in determining if the experiment is appropriate and the steps necessary to proceed with the experiment.

After referring to the Project/Lab Flowchart, additional paperwork may be required along with IRB approval (see page 7).

Teaching safety along with the curriculum is an important aspect of our jobs as educators.

What parent communication is required?

K - 6th grade parents will be informed about their child's science fair project though teacher communication. This could be in the form of a weekly newsletter or on the class website.

7th - 8th grade parents will be informed about their child's science fair project through teacher communication.

High school teachers will communicate project requirements and information with parents.

*Additional forms may be required depending on the nature of the project.

INVENTIONS

There is no longer a mousetrap car competition at HISEF. Inventions or mousetrap cars must be created within the context of a controlled experiment and aligned to grade level curriculum to be an eligible science fair project.

Ways to Improve the Science Fair Experience!

Parking Lot

- What it is: A place for students to post questions about current science activities. These questions can then be turned into science projects that align with the curriculum and do not become additional work that takes away from instructional time.

- A permanent location in the classroom where students can post future ideas. This teaching tool can be used in the classroom to have students generate science fair project ideas/questions. After completing classroom activities students would suggest modification/variable changes to make it a new testable investigation.

Making the Parking Lot a part of each science lesson

- If you do an experiment or investigation it can be as simple as "What could we change?" to help create new experiments.

- Examples:
  -What variables could be changed in this experiment?
  -What new questions do you have after completing the experiment?

What is working at other sites?

Here are a few suggestions that might increase community involvement at your site.

Cross-curricular Nights

-Tie the science fair to other curricular areas/events to create higher attendance. For example, Science and Math night or a Celebration of Learning focusing on all content areas

Communication

-Create newsletters, marquee announcements, postings on school website, emails, and phone calls

Soliciting Judges

-Teachers at school site, local corporate volunteers, high school students, parents
-Teachers outside contract hours receive HLIR incentive

Family Involvement for HISEF

-Invite families to attend HISEF
-Share information in school site announcements, newsletters and websites

Do you use the 5 + 2E'S?

Using this method of Inquiry will help insure that teachers are covering Strand 1 - The Process Skills.

Excite
Explore
Explain
Expand
Extend
Exchange
Examine

IRB

In CUSD, the Institutional Review Board (IRB) is a committee of district administrators, certified teachers and classified staff who review projects and evaluate the potential physical/ psychological risk, especially for projects involving human subjects. Projects involving humans, hazardous chemicals, and animals require IRB approval and must receive that approval before the project begins. (See below for further information)

Dates 2015-2016

Send projects to the IRB via district mail (attention Cassandra Schmidt) to the IRC at least one week prior to the scheduled IRB dates.

Sept 15, 2015

*If approval is needed prior to 9/15/15, please contact the IRB.

Oct 20, 2015

Nov 3, 2015

Dec 1, 2015

Jan 12, 2016

Feb 2, 2016

Projects involving the following require IRB approval...

Human Participants/ Consumption, Hazardous Chemicals, Vertebrates/ Invertebrates, Fire/ Explosives/Weapons, Rockets, Bacteria/Mold.

Song lyrics that are not appropriate, projects that pose a medical risk, and any item that a student cannot bring to school will not be approved.

PROJECTS INVOLVING MOLD WILL NOT BE APPROVED.

What needs to get approved K - 12?

- Human Research: This includes review of any surveys or questionnaires to be used in a project, as well as risk activities, such as exercise, sensory responses, emotional and physical responses to stimuli (including, but not limited to, measuring heart rate…).
- Hazardous Chemicals: Projects in which students are proposing to use chemicals must be pre-approved (including, but not limited to: bleach, ammonia, motor oil, household cleaning products, any type of medicine, or any other hazardous material)
- Vertebrates: Projects involving vertebrate animals will need additional SRC (Site Review Committee) approval.
- Consumption: Projects involving tasting, smelling, ingestion, and absorption.
- Fire: Requires administrative approval before coming to IRB and cannot be conducted in classrooms with carpet or without sprinklers.
- Rocket Launching: Must adhere to the Rocket Guidelines found on the CUSD science curriculum webpage.

What if I am still not sure what forms I need?

Go to the science curriculum webpage on the CUSD website and select the correct link to download the necessary forms and additional requirements for IRB approval.

AFTER IRB?

After you submit your project you will get one of three replies:

1. Project approved
2. Revisions required
3. More than minimal risk- project not approved

If your project is approved you will also receive an IRB sticker with instructions on where to place the sticker on your board. The sticker informs judges the project has IRB approval.

Qualified Scientists

Required for some projects. They must possess a doctoral or professional degree in the subject area a student is studying.

Who Serves on the IRB?

Denise Lewis
CHS

Kate Nall
BHS

Cassandra Schmidt
IRC

Kristi Glassmeyer

Cristi Sims
ACP

Debbie Nipar

Mina Bhagdev

HHS

Renee Sweeden
IRC

Making sure your project gets approved the first time.

Step #1

Follow the Project/Lab Flowchart on the CUSD Website to determine if a project may require IRB approval. If you are uncertain, move on to step #2. No projects involving mold conducted outside a Biosafety Level 2 Lab will be approved.

Step #2

Go to the CUSD website. Click on the curriculum tab and the science page. Click on "**Click Here for Science Fair Paperwork".** Choose the link that fits your project and download the necessary forms. Be sure to include any additional information required.

Step #3

Fill out each section of all forms. Forms can be filled out online and then printed. Submit all forms and additional information to the IRB. If you have questions, please contact your science cadre representative or science fair liaison for guidance.

Please remember...

Students should write very clear procedures for their science fair project. The IRB needs to know exactly what they are doing. If procedures are unclear, possible approval will be delayed.

Submission Reminders...

If a survey or test is used, a copy must be provided. If music is involved, lyrics must be included.

Get all the necessary signatures. Don't leave any lines blank.

Don't forget to complete all of the paperwork and include all additional information listed on the CUSD website.

Include a curriculum alignment form for the grade level (K-8).

Make a copy of all paperwork and send it to the IRB (attention Cassandra Schmidt) via district mail to the IRC.

Send your project in early in case revisions are required.

FERPA

What is it?

Family Educational Rights and Privacy Act.

What does it mean for science fair?

Projects that involve a human survey may require additional approval. Once the IRB has approved your project it will be sent to the FERPA coordinator for additional approval.

How do I make sure that my project will pass FERPA and the IRB?

Make sure that you include the following information on Form 4 and the Implied Consent Form: No names will be included in the research and individuals can drop out at any time. Please provide very clear instructions. You must include the survey you are planning on using.

PROJECTS REQUIRING FERPA APPROVAL WILL NEED TO BE SUBMITTED AS SOON AS POSSIBLE. THIS WILL ALLOW TIME FOR THE PROJECT TO GET APPROVAL FROM BOTH IRB AND FERPA.

Delivery and Pick-up Procedures

- Elementary & Jr. High projects are to be delivered by the site's Science Cadre member or Science Fair Liaison to Hamilton High School foyer (front entrance) on Friday, February 26, 2016, between 2:30 and 5:00 p.m.
- High School projects are to be delivered Thursday, February 25, 2016, between 2:30 and 5:00 p.m.
- Projects will need the following information attached prior to drop-off:
    - IRB sticker, if needed
    - Project labels
    - Envelope on back of board with the following: (All forms can be found on the CUSD science curriculum webpage)
        - Curriculum Alignment form
        - Signed photo release form
        - Lab book (only one lab book is needed if working in group)
- Projects that don't have the correct forms (see above), or do not adhere to grade level curriculum expectations will not be judged at site fairs or HISEF.
- NO experiments, props, or face photos may be displayed on or in front of boards.
- Be sure to remove all site fair ribbons prior to delivering the boards to HISEF.
- Each site needs to notify cadre who will be picking up the boards. Boards and awards may be picked up AFTER the awards ceremony to ensure that these items are returned to the correct site/student. Parents and students are discouraged from picking up boards from HISEF.

Registering Projects for HISEF

1. Submit site winners to the database

The cadre member or science fair liaison needs to enter the site fair winners into the HISEF database as soon as winners are announced. Additional guidance is provided at cadre.

2. Registration stickers

Once all schools have entered their winners you will receive stickers that will be placed on the back and the front of your board.

3. Drop off at HISEF

Drop off your board at Hamilton High School during the designated time periods and check in.

4. Day of Fair

Please come to HISEF to see CUSD projects on display and partake in a variety of hands-on STEM activities. Teachers can build relationships with co-workers and the community, and learn a lot by attending and judging.

5. Board pick up

Please **strongly** discourage parents from picking up the boards. The designated pick-up person needs to collect the boards after the awards ceremony. Boards will be stacked by school with awards (if applicable).

What happens after HISEF?

Students who place 1st at their site fair or HISEF can elect to go to AzSEF, the state fair. This fair is outside the district's control.

Registration is required for attendance at AzSEF. Please see the following link for more information.

http://www.azsef.org

Scientific Method

Question – What do you want to find out?

Research – What information did you get from additional sources about this phenomenon?

Hypothesis – What do you think will happen and why? Could be stated in "If/Then" format.

Materials – What supplies will you need to test this hypothesis?

Procedures – What steps will you need to take to make this a fair test and so that it can be replicated?

Results/Data Collection – What did you find out? How will you record these findings? Including charts/graphs/tables, log book plus data analysis.

Conclusions – What have you learned based on the physical and literary research? Share conclusions, reference the hypothesis, collaborate and compare with peers, and create an abstract (grades 6-12).

Future Research – What are additional questions that could be tested? What could be improved about this experiment?

The Rationale of the 5 (plus 2) E's of Inquiry

Excite . . . stimulates the learner's curiosity.

What the student does that is consistent with this model:

Shows interest in the topic by asking questions, such as:

- "Why did this happen?"
- "What do I think I already know about this?"
- "What can I find out about this?"

What the teacher does that is consistent with this model:

- Creates interest
- Generates curiosity
- Raises questions
- Elicits responses that uncover what the students know or think about the concept/topic
- Relates to background knowledge
- Questions student perceptions
- Relates to real life situations

Explore . . . to satisfy curiosity.

What the student does that is consistent with this model:

- Uses inquiry to explore and investigate; to satisfy his/her curiosity about the chosen concept/ topic.
- Thinks freely, but within the limits of the activity.
- Tests predictions and hypotheses.
- Forms new predictions and hypotheses.
- Experiments with alternatives and discusses them with others.
- Records observations and ideas.
- Has no preconceived judgments.

What the teacher does that is consistent with this model:

- Encourages the students to work together with minimum supervision.
- Observes and listens to the students.
- Asks probing questions to redirect the students' investigations when necessary.
- Provides time for students to work through problems.
- Acts as a facilitator.

Explain . . . the concept and define the terms.

What the student does that is consistent with this model:

- Uses various informational resources (Internet, textbook, encyclopedia), group discussions, and teacher interaction to derive definitions and explanations of the chosen concept.
- Explains possible solutions or answers to others' explanations.
- Listens critically to others' explanations.
- Questions others' explanations.
- Listens to and tries to comprehend explanations the teacher offers.
- Refers to previous activities.
- Uses recorded observations in explanations.
- Uses graphs/tables/charts to communicate data.

What the teacher does that is consistent with this model:

- Encourages the students to explain concepts and definitions.
- Asks for justification (evidence) and clarification from students.
- Formally provides definitions, explanations, and new labels.
- Uses students' previous experiences as the basis for explaining new concepts.

Expand . . . discovering new applications.

What the student does that is consistent with this model:

- Applies new definitions, classifications, explanations and skills in transferring prior knowledge to new situations.
- Uses prior knowledge and/or research to ask questions, propose solutions, make decisions, and design experiments.
- Draws reasonable conclusions from evidence.

- Records observations and explanations (Data charts/graphs/ tables etc.).
- Checks for peer understanding.

What the teacher does that is consistent with this model:

- Expects the students to use concept specific language, definitions, and explanations provided previously.
- Encourages the students to apply or extend the concepts and skills in new situations.
- Reminds students of the existing evidence/data and asks:
    - What do you already know?
    - Why do you think . . .

Extend . . . the concept into other content areas.

What the student does that is consistent with this model:

- Makes connections and sees relationships of the concept/ topic in other content areas.
- Forms expanded understanding of original concepts/topics.
- Makes connections of concept/ topic to real world situations. Examples: How does this relate to….? How does this help to explain…..?

What the teacher does that is consistent with this model:

- Looks for concepts connecting with other concepts/topics and/ or with other content areas.
- Asks probing questions to help students see relationships between concept/topic and other content areas. Examples: Explain how this affects further scientific theories? How does this relate to prior concepts?

Exchange . . . ideas, lesson plans, or experiences.

What the student does that is consistent with this model

- Shares information about the concept/topic with others (Peer to peer, classroom to classroom, email, science blog etc.).
- Collaborates by sharing interest with others (Peer to peer, classroom to classroom, email, science blog etc.).

What the teacher does that is consistent with this model

- Shares information about the concept/topic with others (Peer to peer, classroom to classroom, email, science blog etc.).
- Collaborates by sharing interest and/or activities with others (Peer to peer, classroom to classroom, email, science blog etc.).
- Through modeling, sharing and collaborating helps to create a clear picture of the scientific inquiry process.

Examine . . . the student's understanding.

What the student does that is consistent with this model

- Answers open-ended questions by using observations, evidence, and previously accepted explanations.
- Demonstrates an understanding or knowledge of the concept or skill.
- Evaluates his or her own progress and knowledge.
- Uses self-reflection to demonstrate their understanding of the concept/topic.
- Shares new insights and unexpected results.

What the teacher does that is consistent with this model

- Observes the students as they apply new concepts and skills.
- Assesses students' knowledge and/or skills.
- Looks for evidence that the students have changed their thinking or behaviors.
- Allows students to assess their own learning and group-process skills.
- Asks open-ended questions like:
    - Why do you think . . . ?
    - What evidence do you have?
    - What do you know about . . . ?
    - How would you explain . . . ?

Using your daily experiments and demonstrations to pick a topic for science fair.

Finding an appropriate topic can be the most challenging part of science fair. The topic should interest the students and should tie to the curriculum that you are teaching. How can you make sure that both happen?

Try playing this quick game with your students after you do a demonstration. Ask them to name as many things that you could change to make this an experiment. An example of this would be making a paper airplane. What could you change? Wing size, Weight, Paper type,.....

When you are done with with this quick example take the suggestions and put them on your parking lot. You will start to build up a list of science fair topics that are tied into your curriculum and student created.

Vocabulary

Controlled experiment: An investigation in which one variable is changed to reveal the effect while all other variables remain unchanged

Question/Problem Statement: A statement of curiosity that can be possibly answered through experimentation.

Hypothesis: A possible explanation, based on research, for an unexplained phenomena or observation that suggests a possible correlation between our independent and dependent variables. Usually written as an If… then…because statement.

Prediction: A statement of an expected outcome

Independent variable (Manipulated): The variable or factor that will be manipulated or changed.

Dependent variable (Responding): The variable that is measured, observed and may change as a result of the independent variable (Being changed).

Constants: All factors that remain the same in an experiment.

Control Group: The test subjects (objects or organisms) that are left untreated or unexposed to the independent variable and compared with treated subjects in order to validate the results of the experiment.

Data/Results: Recorded observations that can be quantitative or qualitative in nature. Quantitative data are measured, counted, or calculated. Qualitative data are observed with your senses.

Conclusion: A research-based explanation of your results and a statement of support or contradiction for the hypothesis.

Words	Examples
Question/Problem	Does the amount of water affect plant growth?
Hypothesis	K-5: The plant will grow to reach different heights. 6-12: If the amount of water changes, then the plants will reach different heights because plants have an ideal amount of water required and if more or less water is given, it will affect plant growth.
Prediction	K-5: The plant that receives the most water will grow higher than the plant receiving 1/2 of the recommended water, but neither will grow as high as t4he control. 6-12: The plant receiving the most water will grow taller than the plant receiving 1/2 water because plants grow better in rainy areas than dry areas. The control will grow tallest because it receives the ideal amount of water.
Independent Variable	The amount of water given to plants.
Dependent Variable	The height of plant growth.
Control Group	The plant will receive the amount of water indicated on seed packets.
Constants	Lighting, position in room, temperature, types of seeds and all other variables except water remain constant.

Days	Con-trol	Plant A	Plant B
1	2 cm	0 cm	2 cm
2	5 cm	0 cm	2 cm
3	7 cm	0 cm	0 cm

Word	Example
Data/Results	Quantitative Data: (See Chart above) Qualitative Data: After day 1, the control plant and plant B looked healthy and green with a stem and leaves, Plant A showed no growth. On day 3 plants looked similar, but the control plant was taller. On day 5, plant B tipped over and started to die, while the control plant continued to grow and no growth was seen from plant A. The data show that the control plant grew the tallest. Plant A, which received 1/2 of the rec-ommended water did not grow. Plant B which received twice the water and initially grew at the same rate as the control, but by day 5 had died.
Conclusion:	The hypothesis was supported because plants reached different heights based on the water they received. The control plant grew the highest because it received ideal watering conditions. Plant A did not grow because it did not receive the necessary amount of water to support growth. Plant B grew initially because it had sufficient water, but over time the excess water drowned the roots in the soil.