



Louisville Regional Science & Engineering Fair
Promoting creativity and building the future for kids

lrsef.org · info@lrsef.org · 727 West Main St. Louisville, KY 40202

PROJECT GUIDELINES

SENIOR DIVISION

GRADES 9-12

*THIS GUIDEBOOK IS THANKS TO LRSEF FAIR DIRECTORS

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**Please note that the details and information listed in this booklet is subject to change each year prior to the LRSEF. For updated information, please see the online websites of the affiliations listed below.*

PARTICIPATE IN THE LOUISVILLE REGIONAL SCIENCE AND ENGINEERING FAIR

INTRODUCTION

The Louisville Regional Science & Engineering Fair is held each year in March and is open to all students in grades 6-12 from 52 Kentucky counties.

Volunteer professional judges select up to three winning projects to receive ribbons and cash gifts in 22 categories. All entrees are also judged for over 50 special awards given out at the close of the event. Three top middle schools/junior high schools compete for school awards and trophies.

The first and second place category winners are eligible to compete at the Kentucky Science & Engineering Fair (KY-SEF) held at Eastern Kentucky University.

The top 10 percent of winning projects in grades 6 – 8 are nominated to be eligible to enter the Broadcom MASTERS competition in June of each year. About 300 Semifinalists are selected in the fall and 30 Finalists win a week-long trip to Washington D.C.

In celebration of the 50th Anniversary of the LRSEF in 2014, our title sponsor, General Electric Appliances, created the Best of Fair GE Award Fund of \$25,000. This fund was a GE Community Leadership gift by Kevin Nolan, VP of Global Technologies.

Beginning in 2014 and continuing for the next nine years, the top three Senior Division projects will each receive a \$420 check and a special commemorative trophy designed and manufactured by volunteers at GE Appliances, a Haier Company. Top Junior projects win a \$240 check and the trophy, as well.

The top high school winning projects and their teachers are selected for an all-expenses-paid trip to the Intel International Science & Engineering Fair (ISEF). Although ISEF is for grades 9 -12, many top winners continued projects started in middle school.



LET US HELP YOU

We know it can be difficult to decide on a project topic. Perhaps you have your idea in mind and are having trouble getting started. Maybe you just need a little guidance as to how to make your project one of a kind. No worries, we have a list of helpful links that should come in handy with whatever you are struggling with. Also, don't hesitate to ask our LRSEF fair co-directors for guidance. Send your questions via our "contact us" section of the website or by emailing info@lrsef.org.



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THE EVENT

LOUISVILLE REGIONAL SCIENCE & ENGINEERING FAIR

Kentucky Science Center, Louisville, Kentucky

The event schedule will be posted online at <http://lrsef.org>

ONLINE REGISTRATION

Registration opens each fall and the deadline is about two weeks before the LRSEF. The registration details and deadlines will be posted on lrsef.org and LRSEF Facebook page.

All LRSEF Registration is completed **only through the only system called STEM Wizard. There are 3 ways you can register:**

- 1) If your schools **is hosting a competitive science & engineering fair** and using STEM Wizard, **your teacher or sponsor will promote you to LRSEF.**
- 2) Some schools **with 10 or more students in a science club or research class also use STEM Wizard** and will work with **your teacher to promote you to LRSEF.**
- 3) For those who **do not have a school based STEM Wizard account**, you will register and **create your account through by using our website at <http://lrsef.org>**

All students must pay a \$10 nonrefundable fee for LRSEF. Credit card payments are preferred and accepted at <http://lrsef.org/StemWizard>. Some of our schools also pay by Purchase Order/Invoice.

If you or your school must **mail check payable to LRSEF to:**

Louisville Regional Science & Engineering Fair

c/o Kentucky Science Center

727 West Main Street

Louisville, KY 40202



lrsef.org



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QUICK REFERENCE OUTLINE

1. Discuss participation in the LRSEF with your teacher and an Adult Sponsor
 - Speak with your science teacher first and follow any school guidelines
 - Any adult with a STEM background can sponsor; Teacher, Parent, or Mentor
 - <https://student.societyforscience.org/roles-and-responsibilities-students-and-adults>
2. Read through this instruction booklet and the ISEF Student Handbook
 - <https://member.societyforscience.org/document.doc?id=632>
 - <https://student.societyforscience.org/international-rules-pre-college-science-research>
3. Select a topic within the 22 categories
 - <https://student.societyforscience.org/intel-isef-categories-and-subcategories>
4. Research your topic
5. Get organized and plan a timeline
6. Design your experiment
7. Complete the ISEF Rules Wizard to determine what forms and approvals are necessary before beginning your research
 - <http://apps2.societyforscience.org/wizard/index.asp>
8. Conduct your experiment
 - Keep a scientific notebook, record references and data, take photographs
 - Analyze your results
 - Draw conclusions
9. Write a research paper
10. Complete the application process
 - Register online through your school or directly with LRSEF at <https://lrsef.stemwizard.com>
 - Pay your \$10 fee to LRSEF (payment may be made via credit card through your STEM Wizard account)
11. Create a visual display
12. Prepare for judging
 - Practice effective communication and presentation skills
 - <http://school.discoveryeducation.com/sciencefaircentral/Science-Fair-Presentations/How-to-Deliver-a-Good-Oral-Presentation.html>
 - http://www.sciencebuddies.org/science-fair-projects/project_judging.shtml#keyinfo
13. Attend the Louisville Regional Science & Engineering Fair



TOPIC SELECTION

1. Choose a topic that is meaningful to you and relevant to others
2. Study the rules and guidelines for the fair to stay competitive and avoid being disqualified:
<https://student.societyforscience.org/international-rules-pre-college-science-research>
3. The project must be an experiment using the scientific method to solve a problem or answer a question; demonstrations are not eligible to compete.
4. Choose a category that best fits your topic
 - The categories are listed below. Review ALL categories to choose the one that best fits your project. These categories can also be found at the following link:
<https://student.societyforscience.org/intel-isef-categories-and-subcategories#EM>
 - Categories:
 - [Animal Sciences \(ANIM\)](#)
 - [Behavioral and Social Sciences \(BEHA\)](#)
 - [Biochemistry \(BCHM\)](#)
 - [Biomedical and Health Sciences \(BMED\)](#)
 - [Biomedical Engineering \(ENBM\)](#)
 - [Cellular and Molecular Biology \(CELL\)](#)
 - [Chemistry \(CHEM\)](#)
 - [Computational Biology and Bioinformatics \(CBIO\)](#)
 - [Earth and Environmental Sciences \(EAEV\)](#)
 - [Embedded Systems \(EBED\)](#)
 - [Energy: Chemical \(EGCH\)](#)
 - [Energy: Physical \(EGPH\)](#)
 - [Engineering Mechanics \(ENMC\)](#)
 - [Environmental Engineering \(ENEV\)](#)
 - [Materials Science \(MATS\)](#)
 - [Mathematics \(MATH\)](#)
 - [Microbiology \(MCRO\)](#)
 - [Physics and Astronomy \(PHYS\)](#)
 - [Plant Sciences \(PLNT\)](#)
 - [Robotics and Intelligent Machines \(ROBO\)](#)
 - [Systems Software \(SOFT\)](#)
 - [Translational Medical Science \(TMED\)](#)



WEB RESOURCES

1. International Science & Engineering Fair: <https://student.societyforscience.org/intel-isef>
2. Louisville Regional Science & Engineering Fair: <http://lrsef.org>
3. Broadcom MASTERS: <https://student.societyforscience.org/broadcom-masters>
4. University of Louisville Library: <http://louisville.edu/library/>
5. SSP Student Science Research: <http://student.societyforscience.org/intel-sts>
6. NASA How to Do a Science Fair Project: <http://www.jpl.nasa.gov/education/sciencefair/>
7. Science Fair Project Ideas, Answers, & Tools: <http://www.sciencebuddies.org/>
8. Discovery Channel: <http://school.discoveryeducation.com/sciencefaircentral/Getting-Started.html>
9. USGS Earth Science Experiments: <http://earthquake.usgs.gov/learn/kids/sciencefair.php>
10. Science *Daily*: <https://www.sciencedaily.com/>
11. Science Friday: <http://www.sciencefriday.com/>
12. Journal of Nature: <http://www.nature.com/>
13. SSP Science News: <http://www.sciencenews.org>
14. AAAS Science News: <http://www.eurekalert.org>
15. Carolina Biological Supplies: <http://www.carolina.com/>
16. Ward's Science: <https://wardsci.com/>
17. Flinn Scientific: <http://www.flinnsci.com/>
18. Superior Supplies: <http://www.superiordisplayboards.com>



RESEARCH

Libraries offer free access to scholarly information, computing, and research assistance.

- The Kentucky Virtual Library offers free access to EBSCO Host and other databases: <http://www.kyvl.org/highschoolresources.shtm>
- University libraries will allow high school students to utilize their catalog on site only.
University of Louisville: <http://louisville.edu/library/>
Ekstrom Library on Belknap Campus: <https://louisville.edu/library/ekstrom/>
Kornhauser Library in Medical School: <https://louisville.edu/library/kornhauser/>

Other libraries in the Louisville Metro region:

County Library	Web Address
Anderson County Public	http://www.andersonpubliclibrary.org/
Boyle County Public Library	http://www.boylepublib.org/
Bullitt County Public Library	http://www.bcplib.org/
Hardin County Public Library	http://www.hcpl.info/
Louisville Free Public Library	http://www.lfpl.org/
Marion County Public Library	http://marion.ent.sirsi.net/client/default
Meade County Public Library	http://www.meadereads.org/
Mercer County Public Library	http://www.mcplib.info/
Nelson County Public Library	http://www.nelsoncopublib.org/
Oldham County Public Library	http://www.oldhampl.org/
Shelby County Public Library	http://www1.youseemore.com/Shelby/default.
Spencer County Public	http://members.iglou.com/scpl/
Washington County Public	http://www.wcpl.net/

Research Materials - a good bibliography will include the following materials:

- Write a bibliography using www.bibme.org
- One science textbook
- One science journal
- Maximum one encyclopedia
- Maximum one .com website
- Unlimited .org, .edu, and .gov websites
 - Cite the address and dates visited

RECORD KEEPING

1. Keep a dedicated scientific notebook of all work done on your project.
 - Leave the first few pages for a title page and table of contents.
 - Label entries with titles, dates and times, etc.
 - Mistakes are a valuable part of research and notebooks can be a little messy.
 - Include all handwritten brainstorming, sketches, research notes, experimental methods, data tables, graphs, results, and discussion.
 - Include possible errors, controlled variables, and all things that may have affected the outcome of your experiment.
 - It is acceptable to glue in computer generated graphs and tables.
 - Use a computer generated time/date stamp below the frame.
2. Store all printed materials in a binder.
3. Take pictures as you conduct your experiment
 - Place a size reference in the frame if needed.
 - Use the camera time/date stamp.
4. Organize electronic files and keep backup copies.



ORGANIZATION AND TIME CONCERNS

- Research projects can get complex, so it's important to develop a system for organizing all the related components. Logically narrow down your research topic to focus on a specific area. Use a three-ring binder with four dividers labeled as:
 - final paper
 - forms
 - research
 - data

Use this binder to organize everything used in your project. It's also a good idea to create a backup plan in case something gets lost. Be sure to label everything with your name and address but **not your grade, teacher's name or school.**

- A timeline is important for making sure all your project components are completed by the due dates. Most projects can be completed in 6-8 weeks. Some of the exceptions are:
 - Projects that involve plants or biologic growth as they need the time that nature intended.
 - Research institution projects due to the rules and regulations that the institution must follow with students.

If your school or district holds a STEM fair, **work backward from its deadlines.** Adult sponsors responsible for a school-wide or district-wide fair will need time to complete the checklists and approve your research plans. Prior to the registration deadline your project and all paperwork must be completed by students, parents and teachers including:

- Project
- Research paper
- Abstract

The display is completed last and is needed on the day of the fair.



RESEARCH PLAN

1. Write a research plan and submit it to your adult sponsor/teacher for approval.
 - a. Think of a problem or question.
 - b. Form a hypothesis. Use an if _____, then _____ format.
 - c. Design an experiment that is limited to one variable.
 - d. Establish a control group.
 - e. The experiment should produce quantitative data.
 - f. You must repeat your experiment a minimum of three times to ensure statistical validity.
 - g. Utilize free resources available through universities such as mentors, libraries, and lab equipment.

2. Complete the forms available by the ISEF Rules Wizard:
<https://apps2.societyforscience.org/wizard/index.asp>
 - a. Save the Rules Wizard results page for the entry application
 - b. Student checklist (Form 1A)
 - c. Approval form (Form 1B)
 - d. Other Safety Review Board forms. For questions, email LRSEF through the "contact us" link on the website.

3. Have your sponsor/teacher complete the Adult Sponsor checklist (Form 1), which can be found on the Rules Wizard results page.

4. **ONLY Continuation projects require ISEF Form 7.** Include a summary of the first-year project and demonstrate the logical progression of the project into the second year.

5. Once your Adult Sponsor has approved your research plan, you may conduct the experiment.



RESEARCH PAPER

The research paper must be in an impersonal technical style writing using 3rd person past tense. It is inappropriate to refer to I, me, my, or we. Use a standard font like Times New Roman or Ariel for your paper. Size the body text size at 12 points, format the lines to be double spaced, and set the page layout to 1 inch margins. Ask qualified people including English teachers and librarians to review your draft.

GENERAL LAYOUT

1. Page one: Title page
 - a. Centered on the paper from left to right, top to bottom, double-spaced
 - i. Title of Your Project
 - ii. Your Name
 - b. Do not include your grade level, school, or teacher's name**
2. Page two: Abstract
 - a. "Abstract" centered at the top of the page.
 - b. Only the Abstract should be on this page.
3. Page three: Table of Contents
4. Page four: A continuous paper broken up by subheadings
 - a. Literature Search or Background
 - b. Procedure
 - c. Results
 - d. Discussion or Data Analysis
 - e. Conclusion
 - f. Works Cited or Bibliography - centered at top of its own page, AMA format
 - g. Acknowledgements - only people who worked with you on the project

LITERATURE REVIEW OR BACKGROUND

1. Write a 2-page summary (about 1000 words) of recent literature to define your question, provide your audience with background information, and explain the logic behind your experiment design. Aim to spark enthusiasm and curiosity in the reader. Include:
 - a. An introduction that states the topic and why it is important.
 - b. The question or problem to be explored.
 - c. Background information by discussing past research on the topic.
 - d. Extensive referencing to establish support for the discussion.
2. Use your own words and cite all sources in APA format in the body of the paper.
 - a. Put the author name, a comma, and the year of publication in parenthesis at the end of the sentence. [Example: (White, 1999).] No footnotes are needed.
3. Cite any graphs, pictures, or data you copy or reference. Add the web address just below the image.
4. The bibliography or works cited section should be on a separate page in APA format.



5. Sources can be from the following: magazines, websites, scientific journals, newspaper articles, popular literature, and interviews with experts on the topic.

QUESTIONS TO KEEP IN MIND:

- Was an adequate literature search conducted?
- Was your research from published and recognized institutions?
- Did you understand the literature?
- Did you define the problem?
- Did you cite both recent scientific literature and popular literature?
- Was there a logical progression?
- Were written explanations clear and concise?
- Did you discuss experimental methods being conducted in your field of interest?
- If tables, graphs and/or illustrations were used, did you explain them correctly? Did you cite them correctly?

PROCEDURE

This will be the same information written in your research plan. It is normal for a procedure to be adjusted through trial and error during the experiment. Demonstrate this process in your scientific notebook, but use the final procedure in your research paper.

RESULTS

1. Restate your hypothesis and summarize your findings, include any problems encountered, and interpret the results.
2. Data tables showing your results should have a title, columns must be labeled, and units of measuring must be metric.
3. Colored graphs should be used to demonstrate your findings
 - a. Use graphing software such as Excel or Prism.
 - b. Use the metric system
 - c. Use a consistent color and style format for all graphs
 - d. Label all parts of the graph including title, axis, legend, and data units.
 - e. Show equations and solutions.

DISCUSSION

This section is a summary of what you have done and an explanation of what you have deduced from your experimental results. The following should be included in this section:

1. State your problem once again.
2. State your hypothesis and explain why you formed that particular hypothesis.
3. Summarize your experiment and state the general results.
4. Explain the meaning of the results (the analysis).
5. If your hypothesis was supported, explain why it was correct. If your hypothesis was not supported, then explain why. Note: "proven" is not terminology that should be used



when talking about your hypothesis.

CONCLUSION

In this section you explain any errors, or why your results may have been skewed. You explain what you would do to investigate your topic further. This is a summation of your work and should reflect the amount of work performed. It should be more than a single paragraph. Beware of making sweeping universal statements about the impact of your project.

ABSTRACT

This section summarizes the problem or question, participants, hypotheses, methods used, results, and conclusions. It is usually the first item that a judge will read, so it is extremely important. It is done last, but placed at the beginning of the report. **It must be a minimum of 125 words, and a maximum of 250 words.** Use this to complete the LRSEF Abstract form in the application paperwork.



VISUAL PRESENTATION

Your visual presentation is the first impression someone will have of your project. Purchase a ready-made presentation board that is freestanding for a table display. Be sure to review maximum limits for boards online at <https://student.societyforscience.org/intel-isef-display-and-safety-regulations#disreg> and refer to rules and guidelines. MAKE TYPE LARGE ENOUGH TO BE READ AT LEAST 4 FEET AWAY.



http://www.easyclasical.com/images/figure7_1_1_.gif

Required on display boards:

- Project Title
- Question (Problem) and Hypothesis
- Method/Procedures
- Data Tables and Graphs
- Results and Discussion
- You may have photos of you conducting the experiment. Other types of photos MUST be cited.

Not allowed on display boards:

- Uncited photographs from books, magazines, Internet, etc.
- Acknowledgments for companies, mentors, who have assisted with your project.
- Bibliography or Works Cited

Required on the table with the display board on fair day:

- Research paper bound in a report folder
- Scientific notebook



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WHAT IS NOT ALLOWED AT LRSEF?

Your Project will be checked by the Safety Committee after you sign in and prior to being admitted the LRSEF the event. Please note that the following are NOT ALLOWED AT LRSEF or the State competition.

- Living organisms, **including plants**
- **Soil, sand, rock, and/or waste samples**, even if permanently encased in a slab of acrylic
- **Taxidermy specimens or parts**
- **Preserved vertebrate or invertebrate animals**
- **Human or animal food**
- **Human/animal parts or body fluids** (for example, blood, urine)
- **Plant materials** (living, dead, or preserved) that are in their raw, unprocessed, or non-manufactured state (Exception: manufactured construction materials used in building the project or display)
- **All chemicals including water** (Projects may not use water in any form in a demonstration)
- **All hazardous substances or devices** [for example, poisons, drugs, firearms, weapons, ammunition, reloading devices, and lasers]
- **Dry ice or other sublimating solids**
- **Sharp items** (for example, syringes, needles, pipettes, knives)
- **Flames or highly flammable materials**
- **Batteries with open-top cells**
- **Glass or glass objects unless deemed by the Safety Committee to be an integral and necessary part of the project** (for example, glass that is an integral part of a commercial product such as a computer screen)
- **Any apparatus deemed unsafe by the Scientific Review Committee, the Safety Committee, or Society for Science & the Public** (for example, large vacuum tubes or dangerous ray-generating devices, empty tanks that previously contained combustible liquids or gases, pressurized tanks, etc.)

If you have used some of these items in your project, you may document those procedures with photography on your display board and discuss in your paper and presentations to the judges.



ORAL PRESENTATION

When the panel of judges comes to see your project, they may ask you to explain what you did, or they may simply observe for a few minutes and ask particular questions. Summarize your project in four to five minutes and include the following:

1. Your problem/question.
2. Your hypothesis and why you chose it.
3. How you performed the experiment and collected the data.
4. An analysis of your data.
5. A conclusion, including how you might continue the project.

Be prepared to answer question about the research in your Literature Review or Background section.

IDEAS FOR A GOOD ORAL PRESENTATION:

- Make eye contact.
- Enunciate your words and be confident.
- Show that you are excited and interested in your project.
- Avoid using "umm," "ahh," and "like."
- Do not chew gum!
- Practice your presentation with a video camera, in front of a mirror or for someone else prior to the LRSEF.
- Point to your display board as you explain each part.
- Remember that you are trying to convince someone that you know a great deal about your project.
- Judges will remember more about how you presented your project (approximately 60% of your presentation) than what your actual project is about.
- Be polite, using words such as "yes ma'am," "no sir," etc.
- Shake hands with the Judges after the interview and thank them for their time.



FAIR ATTENDANCE

1. Review the schedule for fair day on the LRSEF website: <http://lrsef.org>
 - a. **Your teachers, sponsors, family and siblings may attend the event and the award ceremony;** they are the guests of the Kentucky Science Center on that day.
 - b. **Family members, teachers and sponsors should not be with you or near your projects while you are being judged throughout the day.**
 - c. Arrange transportation in advance, parking information for families will be clearly marked and published online.
2. Carefully pack your display board, notebook, and paper to prevent damage or loss.
3. Arrive on time.
4. Dress for success.
5. Bring a pen and paper.
6. Register in the lobby
 - a. Your project will be checked by the Safety Committee **before you go to your table.**
 - b. Volunteer hosts will help you find your display table based on category and number/letter designations.
 - c. A chair is provided for each student.
7. **Be prepared to meet and be interviewed by teams of judges and the public all day.**
 - a. Judging takes place both in morning sessions and in afternoon sessions.
 - b. Morning judges select category winners, special awards, school awards.
 - c. Afternoon judges determine finalists' advancements and special awards.
 - d. The Science Center is open to the public from 9:30 am until the end of the LRSEF, so you will be asked to show your project to members of the public as well, throughout the day.
8. Enjoy a 30-minute lunch break
 - a. **Free boxed lunches from Subway are given to registered students only.**
 - b. Lunch is served in the lower level of the Science Center.
 - c. Gallery Hosts will tell you when you are dismissed for lunch.
 - d. Additional snacks are welcome and should be eaten in the lunchroom.
9. At the end of the event be sure and take home your gifts, a participation certificate and any awards from LRSEF, all of your personal items and your project materials.

