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EIA Science Fair Judges Handbook

FOR ELEMENTARY DIVISION

Goal:

➔ Preparing our EIA Students for Life Journey...

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WHAT ARE THE OBJECTIVES OF THE EIA SCIENCE FAIR COMMITTEE?

The Edmonton Islamic School Science Fair (EISSF) Committee holds as its major purpose:
"*The promotion of an appreciation for scientific principles and methods in the youth of EIA by means of an annual science competition.*"

The EISSF strives to meet the following objectives:
➔ *TO ENCOURAGE*:
• Student interest in projects that require the development of the inquiry method and original thought
• Expertise and innovation in scientific fields
• Student to take a serious interest in the field of science as a career
➔ *TO DEVELOP:*
• The ability to collect, organize and interpret data by using the scientific method
• Skills in the art of presentation and communication
• Self-confidence and character in participants

WHAT IS THE ROLE OF JUDGES AT THE EISSF?

The judging experience for our science fair students is an integral part of the learning process and your role as a judge is very important. Interviewing the students, evaluating their projects and giving them appropriate verbal and written feedback introduces them gradually to the next step in the scientific process – peer review. In most cases, you will be the only source of feedback for the students on 'how they did' at the EISSF this year and how they might do better next time. It is essential that students leave our fair with a positive feeling about themselves, their projects and about science. It is your responsibility to make sure that this happens. Therefore, make your comments in a positive way.

THE SCIENTIFIC METHOD

Projects should demonstrate a thorough understanding of the scientific method. The scientific method attempts to remove bias when testing a hypothesis or theory. The scientific method comprises the following steps:
• a reasonable hypothesis is defined after a student has completed background reading
• relevant research (often including experiments) is conducted to evaluate the hypothesis
• a conclusion relating directly to the hypothesis is reached.

A discussion and explanation of the results (unexpected or expected), including ideas on how the project might be expanded and how results might be applied in the future, is essential.

TYPES OF PROJECTS

EISSF projects are judged in one of three categories, depending upon the nature of the project. The categories are experimental projects, innovation projects, and study projects. Regardless of the category in which the project is being judged, the participant(s) should clearly state the problem/objective, and hypothesis based upon existing scientific knowledge in such a way that direction is provided for the remainder of the project. Students should clearly understand the science that lead to their projects as well as future extensions to their work. A rubric has been developed for use with the judging tally sheet.

Experimental projects: These projects involve an investigation undertaken to test a scientific hypothesis using experimentation. The student must recognize variables affecting their research. Manipulated variables are clearly identified and changed one at a time for each experiment. Within each experiment, controlled variables are used to test the outcome of the manipulated variables on

the responding variables. Repetition and (or) sample size is used to verify results obtained in the course of research. Sources of experimental error are identified and allowances have been made for them. The progress of the research is noted in the logbook.
➔*Experiment:* Start with a question, make a hypothesis, test controlled variables, record & analyze results

Innovation projects: These projects focus upon the development and evaluation of innovative devices, models or techniques in technology, engineering or computers (hardware or software). The student should demonstrate an understanding of the properties of the materials/methods used and the reasons for choosing them. An understanding of the effectiveness of the design is essential. The innovation should be tested and modified if shortcomings are noted.
➔*Innovation:* Design a product or process to solve a particular problem, run trials, record & analyze results

Study Projects: These projects involve the collection and analysis of data to reveal evidence of a fact or a situation of scientific interest. It could include a study of cause and effect relationships or theoretical investigations of scientific data. These projects include literature surveys, construction models or case studies. In presenting projects of this type the information should be of considerable depth, quantity and variety. The scope of the topic (whether far-reaching or of very narrow focus) should be understood by the student. The gathered data needs to be critically analyzed and interpreted by the student and the progress of their research should be chronicled in their logbook.
➔*Study:* Start with a question, state a hypothesis, observe naturally occurring variables, record & analyze results

THE INTERVIEW

This is the most important part of the Science Fair. The only chance for some students to present their project will be to you and your team members. It is important that you spend as much time as possible with the student. Your time should be divided between the presentation and discussion, with some time to complete the evaluation form.

➔*Presentation:* Smile, introduce yourself and invite the student(s) to present the project ("Could you tell me about your project?"). It is better if you sit and they stand when doing the presentation. Listen to the student and do not look at other things. Please be aware of your body language. Be friendly and open; the students are often nervous so it is important for you to make them feel at ease.

➔*Discussion:* When the student has finished the presentation, try to summarize and paraphrase the project. This will allow the student to correct any misconceptions that you have as well as show that you have listened to their project. You can ask questions, and try to use 'I' statements. Remember that these students are not in university, so please tailor your questions and comments accordingly. When you have finished asking questions be sure to thank the student for the presentation. You should also give them some praise about an aspect of the project that impressed you.

GENERAL

All students who participate in the EISSF have worked very hard and have done their best. Their efforts should be recognized under all circumstances. Feedback is the only way the students learn how they did on their project since they don't see their marks. Your comments are vital and let the students know how they could add material to or improve their project. **IT IS IMPORTANT THAT STUDENTS LEAVE WITH A POSTIVE FEELING ABOUT THEMSELVES AND THE SCIENCE FAIR EXPERIENCE.** Please structure your comments in a positive way, remembering that these students are young and don't have the experience that you may have in science. Many students look much older than they

are, yet they are still only in elementary, junior high and can be emotionally fragile. Constructive suggestions for improvement combined with praise will help guide students to become better scientists and will help them develop their projects in future years.

FEEDBACK FOR PROJECTS

Once you have handed in the Judging Team Mark Sheet for the projects you judged, fill out the comment sheet as a group. Make one comment sheet for each student in a project. This will be the only written record that they receive from the fair day. The Comment Sheet should have positive and helpful comments. It should point out where the student has done well and where they can improve. Print or write legibly and all judges should sign the sheets. Make certain that the location numbers are filled in. You can use nice coloured pens and stickers too!

NOTE: If the student gets a 'needs improvement', make sure that you comment positively on why they received this and perhaps give some helpful suggestions as to how they could fix it. This sheet is very helpful for students who do Science Fair projects in future years. It is important to keep your comments structured in a positive and helpful way. For this you can use the 'sandwich technique' (see below).

➔Things to keep in mind:
• It is important to provide this feedback so that the student is aware of where improvement needs to be made in future years. Make sure you tailor your remarks to the level of proficiency they have attained. For example, if a third place winner receives no indication of where they can improve, they might wonder why they didn't receive a second or first place.
• You can either make up comments or use some of the suggested words and phases we have listed in this book for your convenience. We prefer that you make your own as the comments seem more genuine.
• When you have finished, please return all the material, including mark sheets, evaluation forms and comment sheets, to the EISSF committee.

SANDWICH TECHNIQUE

This technique allows you to give comments in a positive and encouraging framework by 'sandwiching' a suggestion between two positive statements.

Sandwich technique = positive/helpful/encouraging

For example, you might say or write to a student:
"I really like the way you chose to present your results in a graph. (POSITIVE) Perhaps next time you could label the axes so that persons reading your graph will know what it is that you measured in your experiment. (HELPFUL) Once you used words to explain your graphs to me it was very clear that you used them to show the relationship between A and B. That was well done! (ENCOURAGING)"

Try using the "sandwich technique" whenever you are offering a helpful verbal or written suggestion to a student.

➔**Useful Sentences:**
• Your objective was clear and your project was well organized and led to an interesting conclusion.
• You chose an interesting topic to demonstrate and used a variety of models to emphasize the points you made.
• Your use of models and diagrams made your project come alive.
• Your topic was interesting and presented in a visually clear manner.
• Your understanding and use of scientific vocabulary certainly added to your project.
• The conclusions you reached were well documented by your research.
• Your experimental design was clear and well thought out. It showed a good understanding of your question.

• Your creativity in developing a method to prove your hypothesis is commendable.
• Your ability to summarize your data in an interesting and meaningful way shows a good understanding of the topic.
• It was interesting to observe how you recognized and controlled the variables in your experiment. Your collection of data was precise and orderly and showed care in your experimentation and observation.
• Your conclusions are valid and are the result of careful experimentation and recording.

➔Useful Phrases:
• Thank you for…
• Keep up the good work.
• It was a pleasure to learn about…
• I really like the way…
• Congratulations for…

➔Useful Words:
original, excellent, well thought out, unique, exceptional, high quality, creative, clever, impressive, valuable, remarkable, ingenious, amazing, commendable, enthusiastic, eager, scientific, intelligent, interesting, inspiring, superior, resourceful, capable, innovative, well prepared, imaginative, hard work, worthwhile, meticulous, wonderful, admirable, well presented, superb

Words Demanding an Explanation: adequate, fair, average, good, satisfactory

Words to Avoid: mediocre, bad, ordinary, too easy, pitiful, too simple, boring, inferior, miserable, uninspiring, simplistic, obnoxious, unacceptable, questionable, common, unprepared, banal, dull, uninteresting, tedious

20 Questions you should expect include

- Where did you get this idea?
- How did you come up with this title?
- What research did you do?
- What was your hypothesis?
- Why did you think that would happen?
- What were your independent and dependent variables?
- What was your control?
- What did you measure and how?
- How did you calculate that result?
- Why did you choose that amount, (or measurement, or piece of equipment, etc.)?
- How did you replicate the experiment?
- What does that graph tell you?
- How variable were your results and what might explain the variability?
- What did you base that conclusion on?
- Why/How are your findings important?
- Who might want to know this information?
- What would be the next experiment you would do?
- What was the hardest part (or most fun, or most exciting, or most surprising, etc.)?
- Who helped you?
- If you had to do it all over again, is there anything you would do differently?

Determining the Winners

➔High marks go to:

- Genuine scientific breakthroughs
- Discovering knowledge not readily available to the student
- Correctly interpreting data
- A clever experimental apparatus
- Repetitions to verify experimental results
- Predicting and/or reducing experimental results with analytical techniques
- In engineering categories, experiments applicable to the "real world"
- Ability to clearly portray and explain the project and its results

➔Low marks go to:

- Ignoring readily available information (e.g. not doing basic library research)
- An apparatus (e.g. model) not useful for experimentation and data collection
- Improperly using jargon, not understanding terminology, and/or not knowing how equipment or instrumentation works
- Presenting results that were not derived from experimentation (e.g. literature search)

One way to help students plan their projects is to make them familiar with the way they will be evaluated upon completing their research. The EIA Scinece Fair uses the following forms when evaluating projects. The judges at the fair are briefed on what to look for when evaluating projects and introduced to the different areas of the scoresheet. Included below are the scoresheets used by the judges at the fair.

EIA Science Fair (Grades 4 - 6)

PART A: SCIENTIFIC THOUGHT – 45%			
Experiment Undertake an investigation to test a scientific hypothesis by the experimental method. At least one ifdependent variable is manipulated; other variables are controlled.	**Innovation** Develop and evaluate new devices, models, theorems, physical theories, techniques, or methods in technology, engineering, computing, natural science, or social science.	**Study** Analysis of, and possibly collections of, data using accepted methodologies from the natural, social, biological, or health sciences. Includes studies involving human subjects, biology field studies, data mining, observation and pattern recognition in physical and/or socio-behavioural data.	
Level 1 (Low) – Mark Range 6 to 15			**Circle One Mark**
Replicate a known experiment to confirm previous findings.	Build a model or device to duplicate existing technology or to demonstrate a well-known physical theory or social/behavioural intervention.	Existing published material is presented, unaccompanied by any analysis.	6 7 8 9 10 11 12 13 14 15
Level 2 (Fair) – Mark Range 16 to 25			
Extend a known experiment with modest improvements to the procedures, data gathering and possible applications.	Improve or demonstrate new applications for existing technological systems, social or behavioural interventions, existing physical theories or equipment, and justify them.	Existing published material is presented, accompanied by some modest analysis **and/or** a rudimentary study is undertaken that yields limited data that cannot support an analysis leading to meaningful results.	16 17 18 19 20 21 22 23 24 25
Level 3 (Good) – Mark Range 26 to 35			
Devise and carry out an original experiment. Identify the significant variables and attempt to control them. Analyse the results using appropriate arithmetic, graphical or statistical methods.	Design and build innovative technology; or provide adaptations to existing technology or to social or behavioural interventions; extend or create new physical theory. Human benefit, advancement of knowledge, and/or economic applications should be evident.	The study is based on systematic observations and a literature search. **Quantitative studies** should include appropriate analysis of some significant variable(s) using arithmetic, statistical, or graphical methods. **Qualitative and/or mixed methods studies** should include a detailed description of the procedures and/or techniques applied to gather and/or analyse the data (e.g. interviewing, observational fieldwork, constant comparative method, content analysis).	26 27 28 29 30 31 32 33 34 35
Level 4 (Excellent) – Mark Range 36 to 45			
Devise and carry out original experimental research in which most significant variables are identified and controlled. The data analysis is thorough and complete.	Integrate several technologies, inventions, social/behavioural interventions or design and construct an innovative application that will have human and/or commercial benefit.	The study correlates information from a variety of peer-reviewed publications and from systematic observations, and reveals significant new information, or original solutions to problems. Same criteria for analysis of significant variables and/or description of procedures/techniques as for Level 3.	36 37 38 39 40 41 42 43 44 45

PART B: ORIGINAL CREATIVITY – 25%

Rank 1 (Low) Mark Range 6 to 10	Rank 2 (Fair) Mark Range 11 to 15	Rank 3 (Good) Mark Range 16 to 20	Rank 4 (Excellent) Mark Range 21 to 25
The project design is simple with little evidence of student imagination. It can be found in books or magazines.	The project design is simple with some evidence of student imagination. It uses common resources or equipment. The topic is a current or common one.	This imaginative project makes creative use of the available resources. It is well thought out, and some aspects are above average.	This highly original project demonstrates a novel approach. It shows resourcefulness and creativity in the design, use of equipment, construction and/or the analysis.
6 7 8 9 10	11 12 13 14 15	16 17 18 19 20	21 22 23 24 25

PART C: VISUAL DISPLAY – 8%		TOTAL
Layout logical and self-explanatory	1 2 3 4 5	
Exhibit attractive and well-constructed	1 2 3	

PART D: ORAL PRESENTATION – 8%		TOTAL
Clear, logical, enthusiastic presentation	1 2 3 4 5	
Response to questions	1 2 3	

PART E: PROJECT REPORT & PROJECT LOG – 14%		TOTAL
Information content / substance	1 2 3 4	
Readability / clarity	1 2 3	
Bibliography and citations	1 2 3	
Project log (hard copy or electronic)	1 2 3 4	

PROJECT EVALUATION SUMMARY		MAX	MARK
PART A	Scientific Thought (from page 1)	45	
PART B	Original Creativity (from page 1)	25	
PART C	Visual Display	8	
PART D	Oral Presentation	8	
PART E	Project Report & Project Log	14	

TOTAL MARK AWARDED TO THIS PROJECT	

JUDGING NOTES

FEEDBACK FOR THE FINALIST(S)
Strengths
Recommendations

Judge's Name (Please print.)	Judge's Signature