Western Manitoba Science Fair

Judging Booklet

Thank you for your interest in judging at the WMSF! This is one of the most important roles at the fair, and the success of the fair is largely due to a job well done by our judges. The purpose of the science fair is to give young people the opportunity to do hands on STEM projects. You represent several important roles to the participants - facilitator, motivator, role model, counselor, and evaluator. Your most important task is to encourage and motivate the participants. Even those whose projects are of modest quality should finish the day with a sense of accomplishment and pride.

WMSF project judging places focuses on evaluating the projects and ranking them in relation to other projects in the same age group, rather than 'scoring' projects and tallying numbers As you will read in this booklet, four criteria/categories are used to evaluate each project. Within these categories, the judges assign a Level and Rating for each project. These levels and ratings are used firstly to allow each judge to decide in a systematic way whether project A is better than project B. Secondly, the same Levels and Ratings are used comparatively between judges in each judging group to determine medal winners among highest level projects.

The project judging can be a challenging process for some students, especially for young or first time students, though most enjoy the chance to discuss their work with someone who is both knowledgeable and sympathetic. Remember to be encouraging and positive in your dealings with the finalists. The contact these young scientists have with you may be the spark that excites them to continue their studies in science.

What You'll Find in This Booklet:

- Level and Rating - describes the four categories used to evaluate each project
- Awarding Medals - guidelines for choosing and ranking the medal winning projects
- Project Feedback - emphasizes the importance of and format for leaving feedback
- Project Evaluation - concepts to keep in mind when evaluating the projects and assigning the Levels and Ratings to each project
- Workflows for Judges - includes instructions, judging rubric workflow, and judging summary form workflow

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Level and Rating

The following four criteria/categories are used to evaluate each project:

Part A: Scientific Thought and Understanding - 40% approximate overall weighting for project

This is the most important criterion for judging a project's merit. The major purpose of the Science Fair is to provide a vehicle for the student to engage in the process of science through an Experiment, an Innovation or a Study. In an experimental project, that process includes physical acts such as data gathering. In an Innovation project, the process involves the scientific evaluation of new devices, models, theorems, physical theories, techniques, or methods in technology. In a Study, the process may involve the scientific analysis of pre-existing data. Such physical processes are meaningless if they are not accompanied by scientific thinking. Once results are obtained, devices built or data analysed, it is the interpretation of those results that is significant. Some aspects of scientific thought include:

- a hypothesis or project design that is clear and well stated based on reading, study, and/or observation. The depth of study is a factor here.
- an experimental procedure that is effective in testing the hypothesis, or an innovative design that is an effective solution to the problem posed, or a study designed to produce significant new insights.
- results and conclusions that are clear, honestly stated, logical, and relevant to the project.
- a clear discussion of any experimental results, design or data analysis.
- carefully considered suggestions for extending the project.
- a demonstration of the deep knowledge of the scientific and/or engineering principles involved.
- a careful extrapolation from what was learned to the subject in general or to related subjects.

Part B: Originality & Creativity – 20% approximate overall weighting for project

Science Fair projects are not expected to be publishable research (although some are). However, originality or creativity is possible even if the project is relatively trivial scientifically or covers well-trodden ground. It is important to take the grade level and age of the finalist into consideration. What is new and creative for a finalist in Grade 7 might well be superficial for a high school finalist in Grade 12. Some aspects of originality/creativity include:

- an original problem or an original approach to an old problem.
- a creative approach to the design of the experiment, the innovation or the project overall.
- an ingenious use of materials and equipment.
- creative or original thinking in the application and the interpretation of any data obtained.
- a project that goes beyond textbooks written at the finalist's grade level.

Part C: Communication - 20% approximate overall weighting for project

Communication is composed of three components: the visual display, the oral presentation, the project abstract/ report (report is mandatory for grades 7—12, and encouraged for grades 6 and under).

Visual Display: A good display tells the story of the project in a logical progression. It uses headings, bullet points, graphs and text in appropriate ways. It can easily be read from a distance of approximately 1 metre away. It uses attractive colour schemes. Judges may evaluate the Visual Display in the absence of the students immediately following the Judges Orientation.

Oral Presentation: The presenter is logical and enthusiastic. The five minute introduction is well thought out and rehearsed, but not memorized verbatim. Questions are handled clearly and show sound knowledge of the project and the associated background.

Project Abstract/Report: Encouraged for grades 6 and under, and **mandatory** for grades 7 through 12, the project abstract/report must be minimum one page, typed. It is a summary of the project, and tells the story of the project with clarity and accuracy. These components should be included in the project report/abstract:

- The project name and name(s) of students
- A statement of the basic problem or question
- A brief summary of observations and/or data
- A summation or generalization of the conclusions drawn as a result of the investigation
- Good grammar and no spelling errors

- SI (metric units), if applicable
- Bibliography and references

Part D: Mentorship - 20% approximate overall weighting for project

Science fair projects from time to time will be mentored, or receive outside assistance. It is important for judges to understand that **mentorship is not at all discouraged**; it can be a useful way for students to conduct research and gain knowledge pertaining to their project. However, it becomes a problem when the student is trying to present information on their project that they do not understand themselves or work they did not do themselves. The purpose for having this mentorship category is to allow the judges to judge the project on its merits alone, and not have to worry about how to adjust the other three categories' ratings if a project was mentored. With this category system, if the judge feels there was mentorship involved, the adjustment is made at the end, and does not affect the other three categories. The other purpose of this mentorship category is to prevent a judge from over penalizing a project for having been mentored, as it only carries a 20% overall importance weighting.
A judge **only** needs to concern him/herself with mentorship if it is clear that the student does not completely understand their project. As long as the student is very knowledgeable in the subject, and can answer all questions about information presented in the project, then it is considered Level 4 - the same level as a non-mentored project.
Important Note: judges can assume that the majority of the projects will rank a full Level 4 here (see rubric), however if a student shows a lack of knowledge in their presentation that is due to mentorship, then the judge may look at assigning a lower level based on the rubric.

Awarding Medals

After all of the projects have been judged, the judges will compare with each other (within their judging group) their Levels and Ratings on the projects to decide which projects are the medal winners. At this time, the judges may decide that it is appropriate to go back to take another look at a few of the projects if necessary in the ranking process. The goal is to award approximately 40% of the projects in each judging group with Medals. 10% of the projects with Gold Medals, 15% with Silver Medals, and 15% with Bronze Medals. Once the judging group has chosen the top 40% projects, they can then decide on the ranking of the medals for those projects.

Project Feedback

Completing the feedback sections on the Judging Summary Form is an important part of the role of a judge. Following each interview, it is important that each judge make a few feedback notes to later be expanded on the Feedback Form. After judging is complete, and after your judging team has ranked its projects, each judge will take responsibility for completing the feedback forms for their judged projects.

- Write in paragraphs using full sentences, not in bullet points.
- Describe the strengths of the project. Find three things to praise.
- Describe the suggestions for improvement or further work.

Example: Good Feedback

Strengths: This project takes the pinhole camera to a new level. You have developed an elegant theory, and then tested it in a series of clever experiments, and showed how to obtain the clearest picture, by changing the diameter of the hole. We enjoyed the way in which you compared your theoretical approach with that of the classical approach due to Rayleigh.

Suggestions: You might want to investigate the rich history of the pinhole camera. A collage of pictures taken with it would add interest to the display.

Example: Bad Feedback

Strengths:

- Good project
- Liked your display

Suggestions:

- Be more assertive
- Make eye contact with the judge

Project Evaluation

The next few items refer to aspects of evaluation, which may be helpful to you as you assign your Level and Rating.

Organization and Completion

Good organization is part of conducting an effective investigation. This includes a clear objective, a plan for carrying out that objective, well-organized and comprehensible data, and a lucid discussion of experimental conclusions and implications. This means, too, that the investigation will have been completed and not simply ended because the finalist may have run out of time. In other words, the project should represent a completed body of work even if the results do not support the hypothesis. Finally, the implications of the project need to be addressed.

Some aspects of organization and completion include:

- Well-defined goal/objective. This can be embodied in the hypothesis or consist of additional statements regarding the project goals.
- Well-organized and executed experimental procedures.
- Data recorded in orderly manner.
- Experiments repeated as needed.
- Project represents a completed body of work.
- Implications of the project fully addressed.
- Well-organized display board.

Effort and Motivation

One measure of this is the amount of time spent on the project, including background reading and project execution. More difficult to determine, but possibly more important, are the depth of reading and resulting project quality as well as what the finalist learned from his/her experience. An additional measure of effort is the quality of the display, particularly its effectiveness in communicating. To the extent that an attractive display may communicate more effectively and indicate greater effort, that aspect also may be considered. Some aspects of effort and motivation include:

- Amount of time spent on project.
- Amount of time spent on background reading and study.
- Extent to which the depth of background reading and study was reflected in the project.
- What finalist learned.
- Display board informative and attractive.

Clarity

Although clarity is a theme found in all of the judging criteria, it applies specifically to certain elements such as notebooks. Some aspects of clarity include:

- Original project notebook available for inspection.
- Project notebook clear, well organized and accurate.
- Hypothesis, purpose, procedures, results, and conclusions clearly stated.
- Project title accurately portrays the project.
- Abstract clear and well written.
- Oral presentations are clear.
- Audio-visual materials, including the display board, clear and relevant.

Adherence to the WMSF Policies and Guidelines

Please keep in mind when reading the following section, that the science fair is meant to be a learning experience for the students. While we want them to be adhering to our policies and guidelines, and for our judges to be encouraging them to do so, we don't want to see a well meaning student overly punished for mistakenly not adhering to rules. Use a common sense approach when implementing the following.

It is important that our judges are familiar with WMSF policies and safety regulations so that they can use this as another tool to recognize the students who have gone to the effort to follow these policies and regulations. A few points to keep in mind here:

- Any project that involves the collection of data on humans (ex. surveys) are subject to the WMSF policies on Participation of Humans. More info on these policies can be found on our website and in the WMSF guide. There are various levels of human participation and various requirements depending on the level. **Please note this is new for 2020 so we would like to be lenient with students who have not followed these protocols this year.**
- We expect students to follow our Project Safety Regulations found in the WMSF Guide, including the following things which should not be brought to the fair:
  - No flammable liquids, gas cylinders or open flames
  - No dangerous chemicals
  - No bacteria or tissues
  - No live plants or animals, or mounted specimens or animal parts
  - For projects involving any of the above, photos should be taken of the experiments and displayed at the fair rather than bringing the physical objects to the fair. **It is important that judges do NOT encourage participants to bring these types of things to the fair as a way to improve their presentation, as that is against our regulations. Participants should be rewarded for following the regulations and presenting their projects within those parameters.**

Judging different age groups and Consistency among Judges

It is important that judges pay particular attention to placing the projects in the appropriate level using the rubric. The only way to achieve consistency between judges is if the judges correctly use the level descriptions in the rubric and place each project in the appropriate level. Using the rubric correctly will result in the most consistent and fair judging of the students' projects. For example, a project in a younger age group is unlikely to ever be placed in a level 3 or higher. This is not to say that project is not deserving of a medal, but simply that the rubric is designed to also accommodate more sophisticated projects from older students.

Comparing projects with widely different levels of sophistication

Sometimes finalists have access to sophisticated laboratories, have advanced scientific equipment available to them, and/or carry out their projects under the guidance of a professional scientist. Comparing such projects with those done in a home environment can be difficult. As a judge, you should not be in the position of assuming that a project would have been better or worse with or without the advantages of better equipment or instruction.
The critical issue here is not the level of the tools used. Rather, it is what the finalist has done with the resources at his/her disposal. If advanced instrumentation is used to further a strong scientific investigation, and that is clearly communicated in the interview, such a project should do well. However, a finalist who does better science and has superior understanding but used only items found in an ordinary kitchen deserves a better rating. The use of sophisticated equipment in a weak project and/or by a finalist who does not understand the scientific principles involved should receive little or no credit.
It is important that the finalist's knowledge should be appropriate to the project and its goals. If advanced instrumentation is used, for example, the finalist should be conversant with the principles underlying that use, and how results obtained from the equipment relate to conclusions reached.

Additional Information

It is strongly recommended that in addition to this Judging Booklet, all judges read the WMSF Guide available on our website at www.wmsf.com.

WMSF Judging Schedule

7:45 - 8:00am	Sign in & find judging group
8:00 - 8:30am	Judges Orientation
8:30 - 9:00am	Find projects on judging floor, read backboards, log books, and project reports (students will not be present)
9:00 - 12:30	Judging (students will be present)
12:30	Work with judging group to decide on medal winners, complete feedback forms, complete judging group checklists, lunch

All forms must be complete and given to a WMSF committee member by 2pm

Workflow for Judging Forms

The new judging form explores 4 categories of criteria: Scientific Thought, Originality & Creativity, Communication, and Mentorship. Use the attached Project Judging Rubric Form to assign a Level to Parts A, B, C, and D for the project. In addition to the Level, please enter a rating from 0 to 9 that reflects the quality of the project and its strength relative to other projects you have assigned the same level.

Part A. Scientific Thought

- First, categorize the project as one of the following:
  - Experiment
  - Innovation
  - Study
- Second, choose a level (1 through 4) by working your way down the category column on the Project Judging Rubric Form.
- Third, rate the project on a scale from 0-9 within that level, based on the quality of the project and its strength relative to other projects in the same level. Record both the level, and rating on the Judging Summary Form.

Part B. Originality & Creativity

- First, choose a level (1 through 4) by using the Project Judging Rubric Form.
- Second, rate the project on a scale from 0-9 within that level. Record on Judging Summary Form.

Part C. Communication

- First, choose a level (1 through 4) by using the Project Judging Rubric Form.
- Second, rate the project on a scale from 0-9 within that level. Record on Judging Summary Form.

Part D. Mentorship

The amount of mentorship provided to students will be determined and used to place the project into one of the 4 levels of mentorship. It is important to note that even if the project is mentored, as long as the student shows a complete understanding of the project no deduction will be given. Use the Project Judging Rubric Form to determine the level (1 through 4) of mentorship. Record on Judging Summary Form.

Feedback Notes (On Judging Summary Form)

The feedback section on the Judging Summary Form is used to make notes which later can be expanded in full on the Feedback Form. It is **VERY** important to leave adequate and constructive feedback for **EVERY** project. A copy of the Feedback Form will be sent to each student.

Western Manitoba Science Fair

Project Judging Rubric Form- Workflow

PART A: SCIENTIFIC THOUGHT - First choose which ONE of the following three categories the project falls under, then work down that column to determine the level:

Choose the category (Experiment, Innovation, or Study) that best fits the project, then work down that category column

	Experiment	Innovation	Study
	Undertake an inv… entific hypothesis… method. At least … ble is manipulated; other variables are controlled.	…ting, natural science, or social science.	…accepted …health …subjects, biology field studies, data mining, o… …n and pattern recognition in physical and/or socio-behavioural data.
LEVEL 1	…icat… …nown experiment to confirm …ous… …gs	Build a model … …duplicate existing technology or to d… …a well-known physical theory or social… …intervention.	Existing published material is presented, unaccompanied by any analysis.
LEVEL 2	…nd … …own… …rime… …th modest …over… …to t… …cedu… …ata gather- …nd … …e a… …ons…	Improve or dem… …v applications for existing technologic… …social or behavioural interventions, e… …cal theories or equipment, and justify…	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.
LEVEL 3	Devise and carry … ori… …expe… …t: Identify the signific… …riabl… …att… …o control them. Anal… …e re… …sing… …- priate arithmetic, g…al c… …stica… …- ods.	Design and buil… …technology; or provide adaptations to … …nology or to social or behavioural inte… …extend or create new physical theory … …nefit, advancement of knowledge, and … …applications should be evident.	The study is based on systematic observations and a literature search. **Quantitative studies** should include appropriate analysis of some significant variables) 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 analyze the data (e.g. interviewing, observational fieldwork, constant comparative method, content analysis).
LEVEL 4	Devise and carry out original experimen… research in which most significant varia… are identified and controlled. The data analysis is thorough and complete.	Integrate several tec… …ogies, 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

Expected Range for Grade 1 – 2

Expected Range for Grade 3 - 4

Expected Range for Grade 5 - 6

Expected Range for Grade 7 - 8

Expected Range for Grade 9 - 12

Work down the chosen category until you arrive at the level that best fits the project.

PART B: ORIGINALITY & CREATIVITY

LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4
The project design is simple with little evidence of student imagina… be found in books or magazi…	The project design is simple with some … common resources or equipment. The topic is a current or common one.	This imaginative project makes cre… … average.	This highly original project demonstrates a … It shows resourcefulness … in the design, use of equipment, construction and/or the analysis.

Work across until you arrive at the level that best fits the project.

PART C: COMMUNICATION

The level is based on four elements: visual display, oral presentation, project report with background research, and logbook.

LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4
Most or all of the four elements are simple, unsubstantial or incomplete. There is little evide… attention to effective communication. In a pair project, one member may have dominated the presentation.	Some of the four elements are simple, unsubstantial or incomplete, but there … communication. In a pair project, one member may have made a stronger contribution to the presentation.	All four elements are complete and demonstrate attention to detail and … ponents are each well thought out and executed. In a pair project, both members made an equitable contribution to the presentation.	All four elements are complete and exceed reasonable ex… …for a student at this age/grade. The visual … …tory, and the exhibit is att… …well-presented. The project report and logbook are informative, clearly written, and the bibliography extends beyond web– based articles. The oral presentation is clear, logical, and enthusiastic. In a group project, both members contributed equitably

Work across until you arrive at the level that best fits the project.

PART D: MENTORSHIP

LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4
The project is mentored. The student has limited knowledge of th… presented in the project.	The project is mentored. The student has …	The project is mentored. The stu… …	The project is not mentored, or … …however the student …y knowledgeable in the subject, and can answer all questions presented by the project.

Work across until you arrive at the level that best fits the project.

Project Judging Summary Form

Project Name: _____

Project Number: _____

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Part A: Scientific Thought		Judging Notes
Record the level you chose using the Judging Form, and then assign a rating within that level that reflects the quality of the project	Level (1-4) / Rating (0-9)	Use this area to make notes regarding information or details that you feel is important to the judging of the project.
Part B: Originality & Creativity		
Record the level you chose using the Judging Form, and then assign a rating within that level that reflects the quality of the project	Level (1-4) / Rating (0-9)	
Part C: Communication		
Record the level you chose using the Judging Form, and then assign a rating within that level that reflects the quality of the project	Level (1-4) / Rating (0-9)	
Part D: Mentorship		
Record the level of mentorship for the project using the Judging Form.	Level (1-4)	

Feedback Notes - record your feedback notes for the project here. You can use these notes to record your full feedback on the Feedback Form, which will be sent to the student after the fair. This page does not go to the student.

Strengths

Use this area to give feedback to the student about the strengths of their project and recommendations on how they might improve their project. **This section must be completed.** This is the most important section of the judging form as it is how the students get feedback on their hard work.

Recommendations

Judge's Name (Please Print)	Judge's Signature

Feedback for the Finalist(s) - It is **VERY** important to leave adequate and constructive feedback for **EVERY** project. A copy of the Project Summary Form will be sent to each student.

Western Manitoba Science Fair

Judging Label

Feedback Form for the Finalist(s) - A copy of this Feedback page will be sent to each student.

FEEDBACK FOR THE EXHIBITOR(S)

Strengths

_____

_____

_____

_____

_____

_____

_____

_____

Use this page to expand your feedback notes from the Judging Summary Form. It is VERY important that you leave complete and adequate feedback for every project. A copy of this page (the Feedback Form) will be sent to each student after the fair.

Recommendations

_____

_____

_____

_____

_____

_____

Judge's Name:

Project Feedback: Examples

Examples of Good Project Feedback:

- Sound knowledge of magnetic fields. Showed an understanding of where particles were coming from and was able to identify what chemicals caused different colours. Further research on the events occurring when particles collide would be a good extension to this project.
- Strengths: This project takes the pinhole camera to a new level. You have developed an elegant theory, and then tested it in a series of clever experiments, and showed how to obtain the clearest picture, by changing the diameter of the hole. We enjoyed the way in which you compared your theoretical approach with that of the classical approach.
- Suggestions: You might want to investigate the rich history of the pinhole camera. A collage of pictures taken with it would add interest to the display.
- Student conducted experiments on reaction time of cell phone users. She made good use of a control group and used statistical analysis to analyze her results. You may want to extend your experiment and test whether there are statistically significant differences between age groups.
- This is a well thought out and explained project. Student made good use of varied stimuli and clearly presented the findings. He applied his findings by outlining how individuals actions can affect the environment. You could extend this project by including research on livestock waste.
- Strengths: Student had a good understanding of what was found to erode limestone the fastest. She enthusiastically presented the material.
- Suggestions: You could continue to explore ways to counteract acid rain perhaps using a neutral pH as a control.

Examples of Poor Project Feedback:

- Strengths: Good understanding. Liked your display.
- Suggestions: Be more assertive. Make eye contact with the judges.
- Good project. Too much reliance on the internet.
- Nice display. Practice your verbal presentation.
- Strengths: Solid experiment.
- Suggestions: Future applications.
- Great job!
- Wonderful project!

- Please do **NOT** encourage students to bring objects to the fair that are against our project safety regulations in your feedback. (ex. ‘it would have been nice to see your live plants at the fair as part of your presentation’).