Judging WRO Future Innovators Category

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Introduction

In the WRO Future Innovators category teams develop a robot that helps solve real-world problems. There is a new theme every year, often connected to the UN Sustainable Development Goals. After research into the theme each team develops an innovative and functioning robotic solution. They present their project on the competition day.

As a judge in the Future Innovators category, you have an important function. There are no concrete tasks to solve in this category. There is no clear "this is correct" or "this is wrong". Judging Future Innovators is always subjective, so you have a great responsibility to make sure all teams are treated fairly.

This guideline will give you information of what WRO expects from judges at an international tournament. In a national competition the expectations are largely the same. But there might not be a video from the team and the national organizer can have some specific procedures and requests.

The section on Innovation and (Social) Entrepreneurship is new at WRO starting in 2022. We ask younger students to think about who they will help with the project and what is special about their idea. Older students should come up with more concrete ideas about how their idea could become reality. They should see it as a 'start-up' proposal.

Age Groups

The WRO Future Innovators category is divided into three age groups: Elementary (8-12), Junior (11-15) and Senior (14-19). There is a one year overlap between age groups on the younger side?

Younger children have a different way of working and of looking to the world than older students. They come with different ideas, and their skills are less developed than older students. This is completely fine. You should always try to judge age appropriately. Try to imagine what a good performance is for the age group you are judging. How did the team do in comparison to other students in their age group? Especially if you judge teams in different age groups at the same tournament day(s) you should take this into consideration.

Younger students may need more help from adults for certain aspects than older students. That is why Elementary teams do not have to perform at the same level as Senior teams. Some coaches or parents are tempted to make the project, robot, or booth look 'better' or to 'help' in other ways. This happens in all age groups. But adults should guide a team, not do the work for them.

Keep in mind that we are looking to reward the team for their work. Part of your job as judge is to assess if the work is done by the team and age appropriate and to decide on your points with that in mind.

Three scoring rubrics

WRO has developed a scoring sheet with three scoring rubrics.

All age groups have the same maximum total score of 200. But for each age group there is a slightly different scoring sheet. The scoring criteria have a slightly different weight / importance in each age group. In Elementary there is a little more focus on the presentation and teamwork. In Junior and Senior there is a little more focus on technical engineering and innovation.
Below a brief description of the rubrics, there is a separate chapter describing all judging criteria.

Rubric "Project and Innovation"

In this rubric it is all about the overall project idea and implementing the idea in real life. You will judge if you understand the overall objects of this robotic solution and the way the team has developed their project idea. This includes the report that the team submitted. You will also judge if the team has thought about people that would use the idea or potential customers. What is special about their idea?
For the Junior and Senior age group there are some extra criteria related to (social) entrepreneurship that you will judge. Junior and Senior teams are also required to present an additional business model aspect.

Rubric "Robotic Solution"

This scoring rubric captures the mechanical and other technical aspects of the project and the software implementation. You will judge if the team has developed a robotic solution that is in line with our general rules (take a look at chapter 5 for a definition) You will also judge if the team is making proper use of coding. Efficiency is important here. Bigger robots or more code is not automatically better.

Rubric "Presentation and Team Spirit"

This scoring rubric is about the presentation and the team. You will judge if the project booth and the presentation explain all aspects of the project in a good way. You will also judge the project booth (e.g. possible decorations connected to the project idea). You will also judge how the team works together and if the team members can work independently.

A further explanation of the different criteria in the three scoring rubrics is attached to this document. You will also find examples for questions you can ask the teams.

Grading a team

You will grade the project idea, the robotic solution, and the overall presentation of the team. Your grading is similar to what a teacher would do: how well does the team perform on this aspect?

As a judge, you will score every criterion with a score from 0 to 10.

0 means:	very poor, very bad, very insufficient, not existing
10 means:	perfect, excellent, nothing to improve

*Example: You score "6" for "Idea, Creativity & Innovation" for an Elementary team. The maximum amount of points for this criterion is 30. The scoring system will automatically calculate the points. (The team will get: 30 * (6/10) = 18 points (60% of 30). This means that you can always use the same scale for each criterion. You do not have to make any calculations. (See the scoring sheets for an example.)*

Getting information to grade a team:

To judge the teams that are assigned to you, you have several sources of information:

- The report of the teams, available before the tournament starts.
- The video of the teams (int. final), available before the tournament starts.
- Observing the teams from a distance during their preparations and the tournament days.
- The judging round with each of the teams.

The judging rounds

You will have an official judge visit with each team. They present their idea and demonstrate their robotic solution (5 mins). You will then have time to ask questions (5 mins). You keep the time as judges.

- You judge in pairs. After you visit a team, you and your co-judge take a moment to discuss the team and share your ideas about grading the different criteria.
- It sometimes happens that you and your co-judge have a different opinion about how the team performed on a certain aspect. It is OK if you both fill in a different score on your scoring sheet. The total scoring of a team will be based on the individual scoring sheets of all judges.
- Each team will be judged by at least 2 judging pairs.
- After all judging rounds you have a judge meeting do decide on the final ranking of the teams.
- Make notes of specific things about a team on your scoring sheet and/or a separate paper. These notes are useful when you meet with all judges to decide on a final ranking for your age-group.
- Making notes will also help filter out teams that could deserve a special award. Or filter out teams that did not follow the Ethics Code…

What happens if I don’t know much about a certain aspect?

Not all judges have the same skills. Some have a technical background; some know a lot about project management or businesses. WRO is a robotics competition, so as a judge you should be interested in robotics. But you don’t have to be an expert. You can learn a lot about the work of the team by just asking them questions. And you will likely have a colleague that knows more about a certain aspect and can ask deeper questions. It is your combined knowledge that is important.

How do I deal with teams from my own country?

As WRO Association it is our responsibility to make sure that the competition is perceived as fair to all teams. To avoid any doubt of preferential treatment of teams we try to allocate judges in such a way that they do not have to judge a team from their own country. But this is not always possible. And that is why we need your help as judge.

If there is a team from your own country on your list, we ask you to divide the tasks in your judging couple. Play a more observing role in the background. Have your co-judge ask the questions to the team if possible. This helps to avoid potential criticism that you are favoring teams from your own country.

During judge’s meetings you should also be careful not to advocate for teams from your own country. Let your co-judge report about your findings towards a team from your own country.

Judging process at an International Final

In this part we describe the process for judging at an International Final. At other events the process could be slightly different.

Preparations

- As a judge you should support and undersign the WRO ethics code and judge guidelines.
- Read the general rules and the season challenge.
- Read the explanation of the scoring criteria carefully. If something is not clear to you, ask your head judge about it.
- Look at the example questions to get an idea of what you can ask a team.
- Make sure that you read all special information that is send to the judges.
- Make time to be present at any judge meetings / webinars that are organized before the event. It is important that all judges have the same information.
- Read the reports from your teams and watch their videos before the event starts.
- Be present at the judges meeting at the start of the event.
- Make yourself familiar with the schedule you need to follow during the day.

Determining the final ranking

At the International Final the process to determine the final ranking of the teams is as follows:

- Each team will be judged by at least 2 judging couples. Usually there are many teams at an international event, so you will get the chance to have a judge visit with all teams.
- The judges score each team based on the available information (report, video, judge visit and general observations.)
- All scoring sheets are entered into the scoring system.
- After all teams have been visited there will be a judge meeting led by the age group head judge.
- The age group head judge will present the teams with the highest scores based on the average points on of all scoring sheets. (Usually between 8 and 12 teams, depending on the event.)
- As a judge you do have the opportunity to propose another team that should be part of the deliberations. But there should be a good reason for that. (Which is why it is important to make notes about teams) Usually the scoring process with multiple independent scores is trusted.
- The judges discuss the shortlist of top teams.
- If needed judges can decide to visit one or more teams again.
- Based on the discussion and possible re-visit the final ranking of the teams is determined. (If needed the points of a team can be altered or a team can get bonus points.)

Judging criteria WRO Future Innovators

Project & Innovation

Idea, Quality & Creativity

Your project should connect to the season theme and to the challenge as described in the season rules. *(Described in part 3 of the General Rules & Season Theme document.)* Your robotic solution should help solve one or more of the problems that are connected to the season theme. Creative thinking is important in your project, so try to find a new approach and think of new ways to solve the problem. The design of your solution should also be innovative and imaginative. Can you think of new uses for materials and resources? Think outside the box!

Research & Report

Before you can build your robotic solution, you need to do research. Which problem do you want to solve and how? You will also do research to find out the best way to build your robotic solution. What materials will you be using? What is the best way to program your robot solution? Talk to other people to find out what they think of your idea. You will produce a report that is a documentation of the development of your project and the research you have done. *(Check article 6.4 of the General Rules & Season Theme document.)*

Usage of the idea (Elementary teams)

You should think about who would use your robotic solution. Who would be helped with your idea? Talk to at least two (2) other people about your idea. (Not your coach or parents) What do they think about it? Do they have some good tips for you?

Social Impact & Need (Junior & Senior teams)

You should think about who would use your robotic solution. Who would benefit from your idea? What is the (social) impact of your idea? Is it important for individuals or for your community or country? Would it benefit people from other countries too? Discuss your idea with at least three (3) other people to get further input. (Not your coach or parents)

Key Innovation & Slogan

You should be able to explain what is unique about your idea. Are there potential competitors? What makes your idea better? You should also present a slogan about your idea - something that will help the public remember your robotic solution.

(Junior & Senior teams only) Extra element of entrepreneurship

You need choose one of the following aspects to explain your idea further.

a) Cost structure: Explain which costs are associated with producing and developing a real prototype of your idea.
b) Revenue Stream: Explain how you could generate income through offering your idea to the market. It could be a social business model as well.
c) Key Resources: Explain what key resources are needed to work on your prototype (e.g. staff, materials, know-how etc.).
d) Partners: Explain what partners are needed to make your idea a reality (e.g. local partners, institutions, investors, etc.).

(Senior only) Next Steps & Prototype Development

You need to present the logical next steps that are needed to develop your idea into a real prototype/product. Think of what you would need to do in the next 6-18 months. You can choose to use the Lean Start-up approach and present how your idea can be rolled-out in this way. For more information visit: https://en.wikipedia.org/wiki/Lean_startup. (But you can also use a different approach.)

Robotic Solution

Robotic Solution

Your robotic solution should have several mechanisms, sensors and actuators and is operated with one or more controller(s). It should be able to do more than a machine that is only repeating a certain workflow as it should make autonomous decisions. Your robotic solution can replace certain parts of human tasks or make it possible to do things we could not do before. *(Check item 5.1 of the General Rules & Season Theme document for the definition of a robotic solution.)*

Meaningful use of engineering concepts

You need to use (technical) materials and components in a sensible and efficient way. Your robotic solution should be well constructed. You should show proper use of engineering and mechanical concepts/principles, for example, in the way you build your robotic solution or use gears, pulleys or levers. You should be able to explain the choices you made.

Code Efficiency & Software Automation

Your robot solution should use inputs from sensors/controllers to run specific routines in a smart and appropriate way. The automation and logic should make sense for your project idea and should be structured and functional. You should be able to explain your code and explain why you have used certain routines and programming languages.

Demonstration of Robotic Solution

You need to demonstrate your robotic solution and it should be reliable. This means that the demonstration can be repeated multiple times. You should be able to explain how the solution works and what could be improved in the future. Your robotic solution is a prototype - not everything will be perfect. If an error happens during the demonstration, you will have an opportunity to solve it or you need to be able to explain why the error happened.

Presentation and Team Spirit

Presentation & Project booth

You need to present your project to the judges in an interesting 5-minute presentation. This presentation should include the demonstration of your robot solution. Your project video is an addition to this presentation and judges will view the video before the judging. *(Check article 6.5 of the General Rules & Season Theme document.)* You should also decorate your booth in such a way that it is informative and attractive to the public. People that visit your booth should be able to get clear information about your project and robotic solution. You can use all kinds of materials to make your project booth look interesting. (Do remember that the goal is to present your robotic solution, not to have the best decorations…)

Technical Understanding & Quick Thinking

You need to be able to explain why and for who your project idea is relevant, how your robot solution works and how you have developed and coded it. You will explain this in your presentation, but you also need to be able to answer questions about your project. This way you demonstrate that you have a good understanding of your solution.

Team Spirit

As a team you show that you value each other's work and the different team roles you have defined for yourself during preparation for the tournament. You are enthusiastic about sharing your idea with others. You also show that you can work on your own, without help from adults, not only during your project, but also when installing your booth or solving technical problems.

Ideas for questions

Project and Innovation

- How did you come up with your idea?
- How does the idea relate to the WRO season theme?
- Where did you find out more about your idea? Did you talk to experts?
- Do you know if your idea is already available somewhere?
- What is special / unique about your idea compared to other (similar) approaches?
- Who would use / buy your idea?
- Did you talk to someone about your idea? (e.g. your parents or friends)?
- What is the slogan that represents your idea?
- Who could help you with your ideas?

In addition, potential questions for Junior & Senior teams:

- What is the impact of your idea?
- Which partners do you need to realize your idea?
- Did you think about other aspects of a potential business model?
- Which resources you would need to implement your idea?
- What are next steps if you would want to realize your idea?

Robotic Solution

- Which technical parts (motors, sensors, controllers etc.) do you use?
- How does your solution work? Where do you start?
- Which elements work together? Does it work completely autonomous, or do you have some kind of human interaction? If yes, how does it help for your project idea?
- What problems did you run into when you designed the robot solution? What was particularly difficult?
- What do you like best about the technical implementation of your project idea?
- Can you show me the code that starts your program?
- Can you guide me through the code you created?
- Can you show me where this sensor/controller/motor is mentioned in the code?
- How did you develop your program?
- Why did you choose this/these programming language(s)? Did you do any research on how you could use your software?

Presentation and Team Spirit

- Are you happy with your presentation? Did it go as expected?
- Did you have any problems in the preparation?
- Did you need to learn a lot for your presentation? Did you get help?
- Who had the idea for your presentation and your project booth?
- Who is the expert for coding / mechanical engineering in your team?
- Who did the research for your project idea?
- How much time did you work on your project before the competition?
- What did you learn from your coach or from friends or other adults?
- Do you plan to continue work on your idea after the tournament day?

Scoring sheets

WRO Future Innovators - Elementary

Project _____

Team _____

Judge _____

	Criteria	Score 0-10*	max points
PROJECT & INNOVATION	**Idea, Quality & Creativity**		**30**
	Research & Report		**15**
	Usage of the idea		**15**
	Key Innovation & Slogan		**10**
	TOTAL		*70*
ROBOTIC SOLUTION	**Robotic Solution**		**30**
	Meaningful use of engineering concepts		**10**
	Code Efficiency & Software Automation		**10**
	Demonstration of Robotic Solution		**15**
	TOTAL		*65*
PRESENTATION & TEAM SPIRIT	**Presentation & Project booth**		**30**
	Technical Understanding & Quick Thinking		**15**
	Team Spirit		**20**
	TOTAL		*65*
	Maximum Points		**200**

Comments:

** Judges give a score from 0-10. For example, if a judge scores "Idea, Quality & Creativity" with a 5, then the team will get 5/10 * 30 = 15 points for this criterion.*

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WRO Future Innovators - Junior

Project _____

Team _____

Judge _____

	Criteria	Score 0-10*	max points
PROJECT & INNOVATION	**Idea, Quality & Creativity**		**30**
	Research & Report		**15**
	Social Impact & Need		**10**
	Key Innovation & Slogan		**10**
	Extra element of entrepreneurship a) Cost structure, b) Revenue Stream, c) Key Resources, d) Partners		**10**
	TOTAL		*75*
ROBOTIC SOLUTION	**Robotic Solution**		**30**
	Meaningful use of engineering concepts		**15**
	Code Efficiency & Software Automation		**10**
	Demonstration of Robotic Solution		**15**
	TOTAL		*70*
PRESENTATION & TEAM SPIRIT	**Presentation & Project booth**		**25**
	Technical Understanding & Quick Thinking		**15**
	Team Spirit		**15**
	TOTAL		*55*
	Maximum Points		**200**

Comments:

** Judges give a score from 0-10. For example, if a judge scores "Idea, Quality & Creativity" with a 5, then the team will get 5/10 * 30 = 15 points for this criterion.*

WRO Future Innovators - Senior

Project _____

Team _____

Judge _____

	Criteria	Score 0-10*	max points
PROJECT & INNOVATION	**Idea, Quality & Creativity**		**20**
	Research & Report		**15**
	Social Impact & Need		**10**
	Key Innovation & Slogan		**10**
	Extra element of entrepreneurship a) Cost structure, b) Revenue Stream, c) Key Resources, d) Partners		**10**
	Next Steps & Prototype Development		**10**
	TOTAL		*75*
ROBOTIC SOLUTION	**Robotic Solution**		**30**
	Meaningful use of engineering concepts		**15**
	Code Efficiency & Software Automation		**10**
	Demonstration of Robotic Solution		**15**
	TOTAL		*70*
PRESENTATION & TEAM SPIRIT	**Presentation & Project booth**		**25**
	Technical Understanding & Quick Thinking		**15**
	Team Spirit		**15**
	TOTAL		*55*
	Maximum Points		**200**

Comments:

** Judges give a score from 0-10. For example, if a judge scores "Idea, Quality & Creativity" with a 5, then the team will get 5/10 * 20 = 10 points for this criterion.*

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WORLD ROBOT OLYMPIAD ™

WRO Guiding Principles for Judges at the International Final

As a judge at the International World Robot Olympiad Final you play a very important role. You have volunteered to do this incredibly important, time consuming, and often difficult job, but without you and other good judges, the competition would not be what is it today.

We would like you to first of all help create a wonderful experience for all the children, one that they will never forget. You do this by keeping the children in mind. This is a competition for children and all the participants here have worked hard all year to make it to this event.

We urge you to treat all the children with respect and treat their endeavors, attempts and work with the same respect. You have a responsibility to make sure that other judges do as well.

As a judge, we expect you to do the following:

- know the rules and the scoring system for the category and age-group you judge
- promote fair play and appropriate behavior by all participants
- match the skill levels and needs of the participants in the age-group you judge
- not to comment on or criticize other judges in public
- remember that this is a competition for children - always give them the benefit of the doubt
- always be on time - for meetings, judging or appointments
- be appropriately dressed - in the judging uniform (no clothing that links you to a country/team)
- be consistent and objective, and not to prejudice towards teams from your country
- accept decisions made by Head Judges or Tournament Directors
- not to share any information about the judging process or scores to anyone who is not a judge
- recluse yourself from judging a team from your country - if and where possible
- supply feedback to the WRO Association if you feel the need for changes to be made
- know the conflict resolution process and how to deal with appeals

Conflict Resolution

Disagreements, complaints or appeals (all in English) must be directed to the judges:

- before signing the score sheet [RoboMission/Future Engineers/Football]
- before the judges leave the booth [Future Innovators]

In the event that a team cannot accept the decision of the judges, the Category Head Judge will make the final decision.

Either of the Head Judges should be present during the deliberation in case the Category Head Judge is the same nationality as the appealing team.

Once the Category Head Judge has made a final decision, the decision may not be appealed further or changed.

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Key elements to being a good WRO judge

Communication
professional dealing with participants,
coaches, parents and fellow judges

Judgement
starts with understanding of rules
grows with experience

Commitment
dedicated to the
cause/task adhere to all
requirements

Fairness
judgements free of discrimination
judgements free of subjectivity

Consistency
same in all
circumstances
apply same rules to all

Integrity
complete absence of bias
unaffected by sources of influence

Rapport
courteous and
respectful
relating effectively to others

What it means to be a WRO Judge

"Although Officiating/Judging involves technical knowledge,
there is definitely an Art to being an effective
Judge/Official/Referee"