

World Educational Robot Contest (WER)

Bricks Robot Contest



Bases & Rules 2020-2021

Theme: Internet of Everything

World Educational Robotics Society

Spring 2021

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1. Introduction

With the development of science and technology, the 5G era has arrived. 5G's ultra-strong bandwidth and extremely low latency have a strong impact and wide application scenarios. Scenes in sci-fi movies, like long-range control, autonomous driving, smart homes, and smart cities will gradually become reality. The wide application of 5G has put people's imagination into realization, making people's life and work more efficient and convenient.

In the future, a wide range of products will have microprocessors and will be connected through a 5G network. At that time, household appliances such as televisions and air conditioners may switch on or off easily by voice or even brainwaves. Home appliances are also likely to become "smarter." They can understand each family user's personality, hobbies and operating habits and can be automatically matched through intelligent recognition, becoming more human-oriented and intelligent.

Of course, the development of science and technology will not always be smooth sailing. In the era of the "Internet of Everything," we also have to face various issues such as personal privacy and information security. Figuring out how to solve these problems correctly and efficiently requires us to brainstorm and work together.

In this contest, contestants should play the role of engineers, use new structures and new technologies through brainstorming to create their own robots to complete various tasks, and also actively consider the possible drawbacks of the future information age, and how to prevent them.

2. Hybrid Dynamic

Due to the sanitary contingency created by the COVID-19 pandemic, the WER Contest USA 2021 will be performed as follows:

- Remote training course: Students will have access to a remote training course ranging from 20-30 hours of self-directed learning to prepare for the tournament through the Makersteam Platform.
- Virtual preparation tournament: There will be an OPEN preparation tournament. The tournament will be remote to preserve the students' health.
- Physical tournament: There will be a physical tournament for each category depending on the availability and permissions established by health regulatory authorities. If the authorities deem it necessary to postpone the physical tournament, it will change to a virtual tournament following the dynamics established before.

3. Team Structure

The competition is divided into three categories:

- Elementary school (4th – 6th grade)
- Middle school
- High school

Each team can be made up of three to four persons:

- 2 - 3 students / competitors
- 1 coach

Competitors from the same team may vary in their academic year, but they all must belong to the same category and be enrolled in the same educational institution the team is representing.

Competitors will be the ones that realize all the activities of the tournament. Coaches provide guidance only, keeping track of due dates, documentation necessary, and general logistics of the team. One coach can be part of multiple teams, but a student may only compete on one team.

4. Training Course (USA customers)

After registering a team to the WER Contest, the school will get access to the virtual training course in the Makersteam Platform (<https://wer.makersteam.us/login>). Inside the course, both students and coaches will have access to information about the competition, such as:

- The theme of the contest and its importance
- How to use the Abilix Krypton kit and its mobile app
- Practice drills and tasks
- Sanitization protocols to follow
- Task kit SK201-T2020: “Internet of Everything”
- Multiple intelligences test
- Special exercises for each team member role

It is not a requirement to complete the training course in order to participate in the preparation tournament or the physical tournament. Nevertheless, it is a valuable resource that will help the teams develop the necessary skills to compete.

5. Key Concepts

- Virtual tournaments will be assisted by the Makersteam Platform.
- The Makersteam Platform will be the main communication channel from the organization committee to the teams. Any announcement will be directed through it.
- As will be further explained, every deliverable for the tournament will be submitted to the platform in order to be evaluated by the judges.
- The team’s account will give them access to a virtual scoreboard, where they will be able to follow the performance of other teams, the deliverables submitted by them, their scores, etc.
- The WER USA Committee reserves the right to publish addendums, announcements, and any other file that may change the dynamics of the tournament as they see fit.

6. Contest Elements

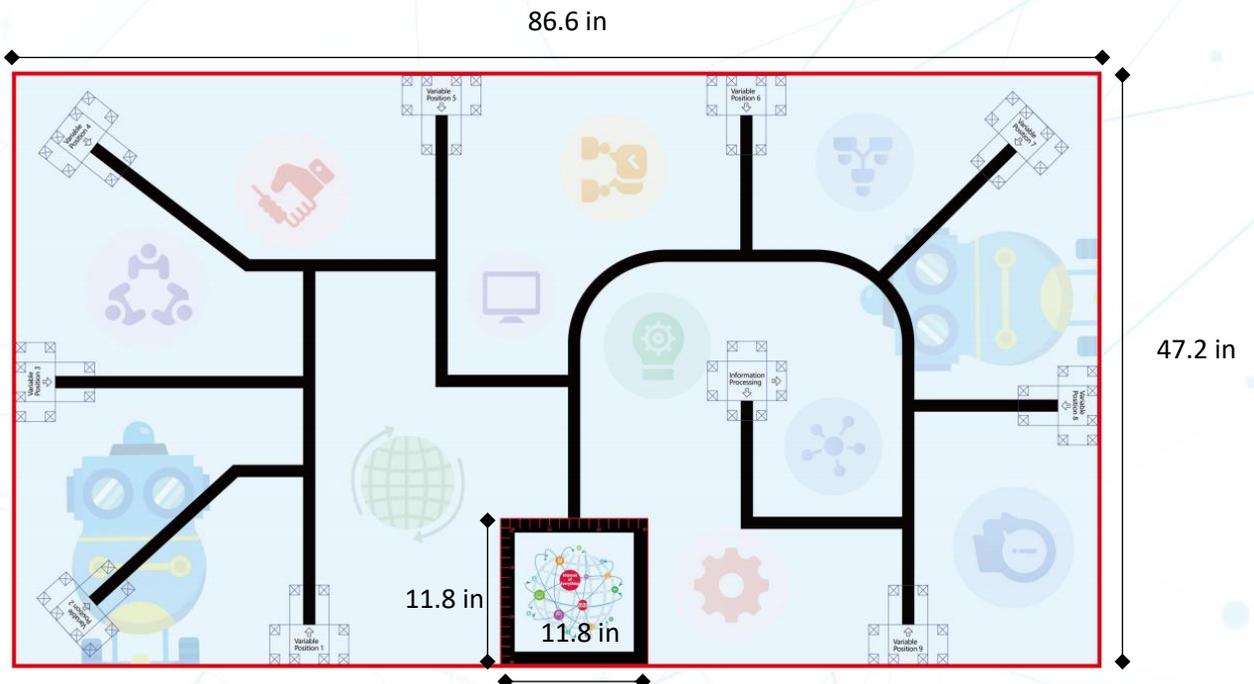
The elements a team will need to participate in the WER USA Virtual Tournament “Internet of Everything” are the following:

- Abilix Krypton robotics kit. Depending on the category of the team, the kit may vary:
 - Elementary school: Krypton 3 + Robotics U or Krypton 4
 - Middle school: Krypton 5 or 6
 - High school: Krypton 7, Krypton 8
- WER Contest Task building kit SK201-T2020, which includes:
 - Contest arena
 - Structural components to build thematic stations

6.1 Contest Arena

The contest arena is the space designed for the teams to solve the different tasks in the thematic stations placed by the tournament. The arena has 10 designated spots, which will be the possible locations for the thematic stations during the contest. It also has a base, where every robot will begin its run in order to travel through the arena to a thematic station.

- Contest arena: 86.6 x 47.2 in (220 x 120 cm)
- Base: 11.8 x 11.8 in (30 x 30 cm)
- Designated task locations: 10 (not all of them may be used on the contest day)
- The exact locations for the contest tasks will be announced on the day of the tournament



6.2 Thematic Stations

A thematic station is a scale representation of a machine or concept directly linked to the theme of the tournament. Each thematic station is built to have one or more tasks.

A task is a specific activity the robot needs to perform autonomously in order to gain points for the team. The difficulty of each task or group of tasks may vary between thematic stations. The more difficult the task, the more points it

will grant the team. Some tasks may need to be performed in a specific order or may be dependent on a previous task.

Some of the common actions a task may ask the robot to do is to push or pull objects, rotate levers, perform pick and place operations, and separate/release magnetically attached parts.

Tasks shown in the Training Course as well as scores shown in this document are NOT the actual tasks and scores of the tournament. They are just examples designed to explain the operation of the tournament.

7. Synchronous Dynamic (May 15th, 2021)

This is the dynamic that will be followed the day of the Virtual WER USA Tournament and will be supported on the Makersteam Platform.

In this stage, teams will be faced with three thematic stations which will be revealed on the day of the tournament.

The evaluation of this dynamic will be based on two types of videos:

1. Thematic station construction, where the team shows the process of building the thematic station and how it properly functions according to the guides provided by the organization committee.
2. Solution video, where the team shows the robot's runs through the arena to the thematic station and solving the task or tasks in it.

These videos will need to be submitted for each thematic station (maximum 6 videos). Additionally, the team will have to submit another presentation video, where each contestant introduces him/herself, the coach, and the working environment. The members of the team must remain the same as in the video submitted during the asynchronous stage.

To show the proper way to make these videos, there will be examples in the Training Course.

This stage of the contest will span approximately 4 hours. Depending on the thematic stations selected for the tournament, the synchronous dynamic will follow this structure:

STRUCTURE #2 – ALL THEMATIC STATIONS AT ONCE

Time schedule	Activity
Stage 1: Opening Ceremony	
7:00 am – 7:30 am	Opening ceremony
Stage 2: Registration	
7:30 am – 8:00 am	Roll call of the teams in videoconference rooms
	Recording the team presentation video
	Upload the team presentation video to the Makersteam Platform
Stage 3: Thematic Station Reveal	
8:00 am - 9:30 am	Release of the assembly manuals
	Construction of the thematic stations
Stage 4: Thematic Station Solution	
9:30 am – 11:30 am	Reveal location of the thematic stations on the arena
	Robot programming and debugging
	Recording the solution video (a single video with all the runs).
	Upload the solution video to the Makersteam Platform.

**Note: Schedule presented in the tables is just example of possible time distributions and an approximation of the duration of the contest. The final schedule will be announced through the official methods prior to the contest.*

***Note: Parts from the SK201-T2020 kit may only be used to build the thematic stations. The teams' robots cannot use any components from this kit.*

7.1 Group Divisions & Videoconference Rooms

Teams will be divided into groups ranging from 5 to 10 teams. Each group will be assigned to a videoconference room in which they will meet their judge. Judges will be in charge of taking roll call at the beginning of the event, evaluating each team and answering questions that may arise about the Contest Program or the Makersteam Platform, keeping up with the remaining time for each stage and announcing when new information has been released on the platform. Judges are not allowed to answer programming questions.

As stated before, teams will be evaluated based on the videos they submit on the Makersteam Platform. It may take up to two workdays after the tournament to finish the evaluation process. All scores will be published on the Virtual Scoreboard on the Platform.

8. Evaluation

The Contest Program will state the total score of each thematic station that will be used during the competition; nevertheless, the value of each task will be revealed with the assembly manual and the operation video for the corresponding stage, depending on the structure of the tournament.

The contest will be evaluated based on the videos submitted to the Makersteam Platform. To create and upload these videos, the team must follow these steps:

- Receive an uploading code through the Makersteam Platform
- Record the presentation or solution video
 - The video begins by stating the code
 - After stating the code, record the introduction of the team or the robot's runs
- Upload the video and submit it through the deliverable section of the platform
- Repeat the process for each video

Once the code has been received,, the team will have 30 minutes to record, upload and submit the video to the platform. If a team exceeds the 30 minute mark, the platform won't allow their video to be uploaded; instead, they will have to generate a new code and start the recording over. The code allows the organization committee to know the exact time the recording began in order to know when it ended, because the time taken for the solution and total run time will be tiebreaker criteria.

8.1 Evaluation Process

During the evaluation of the videos submitted by each team, the judge will consider all aspects that can grant points to the team. Not only does a proper solution to the tasks grant points, but the way the team's robot accomplishes this is important too.

As stated before, WER is a competition where contestants design and program their robot to resolve autonomously a series of tasks. Nevertheless, the way the teams design and program their robots to complete these tasks can be very different. The more complex a program run is, the greater the reward from scoring additional points. The differences between program runs are as follows:

Single Run: The robot starts the run from the base, reaches or tries to reach a thematic station to solve or try to solve its task(s), and returns to the base autonomously. Once the robot has entered or partially entered the base, the team can grab it and change tools, mechanisms and the program to try to solve another station. This situation doesn't add to the restart count.

Multiple-Task Run: The robot starts the run from the base, reaches a thematic station and solves the task(s), then travels to another thematic station and solves the task(s) for that thematic station and travels back to the base. This means the robot has completed 2 or more tasks in a single run.

8.2 Extra Points

Extra points will be granted to teams whose robot is able to perform more than one task in a single run and travel back to the base. Extra points depend on the number of tasks solved in a single run and the amount of times the robot couldn't travel back to the base on its own. These situations are explained below:

- **Restarting Runs:** If a robot is unable to travel back to the base during a run, the team will have to manually take it and put it back in the base. The action of manually taking the robot and putting it back in the base counts as a restart. The amount of extra points granted depends on the number of restarts. More restarts = fewer extra points. To obtain these extra points, the robot has to have completed all tasks from a thematic station. The robot always has to end a run at the base, either autonomously or manually.

The following table is an example to show the relationship between number of restarts and extra points granted. This does NOT mean that the numbers specified are the ones that will be used during the competition. These will be published in the Contest Program.

Number of Restarts	Extra Points
0	10
1	8
2	6
3	4
4+	0

- **Multiple-Task Run:** As stated before, the robot starts the run from the base, reaches a thematic station and solves the task(s), then travels to another thematic station and solves the task(s) for that thematic station and travels back to the base. This means the robot has completed 2 or more tasks in a single run. The number of extra points granted will depend on the number of tasks solved in a single run before arriving at the base (autonomously). If the robot cannot arrive at the base autonomously and the team has to take it back manually, extra points won't be awarded to the team, but they will still get the points for each task. Tasks can only grant extra points for one set of multiple-task runs.

The following table is an example to show the relationship between the number of tasks solved on a single run and the number of extra points awarded. This does NOT mean that the numbers specified are the ones that will be used during the competition. These will be published in the Contest Program.

Tasks Solved in a Single Run	Extra Points
2	10
3	25
4	45
5	70
6	100

8.3 Final Score & Results

The final score of a team will be the sum of the total points accumulated during the asynchronous and synchronous dynamics multiplied by their respective weights. Final scores will be published on the Virtual Scoreboard on the Makersteam Platform.

As stated before, if two or more teams obtain the same final score, the time of recording and time of operation obtained from their codes will be the tiebreaker criteria. All teams that participate in the Virtual WER USA Preparation Tournaments are allowed to compete in the Physical Tournament.

8.4 Virtual Scoreboard

The Virtual Scoreboard is the space inside the Makersteam Platform where the results of the tournament will be published. As shown in Figure 1, the Virtual Scoreboard shows information about each team like their rank, ID, name of the team, school, and score for each thematic station. During the tournament, each cell will update once the team uploads the corresponding deliverable. After the tournament is finished and the judges have finished reviewing each team’s participation, the scoreboard will be updated with the scores of every individual thematic station, and ranks will be assigned depending on the final score of the team. Once the evaluations are uploaded, each cell will have a detailed view with special information such as:

- Video uploaded by the team
- Name of the judge
- Points obtained for each task
- Start time (token)
- Upload time

WER USA World Educational Robot Contest
Tournament results

Search: All

Place #	ID	Team	School	E1	E2	E3	E4	E5	Final score	Final time
1	1005	PrepaTec Eugenio Garza Laguarda 1	PrepaTec Eugenio Garza Laguarda	100	PKDG	-	-	-	100	00:00:35
2	1010	CONALEP Tampico 054	CONALEP Tampico	100	-	-	-	-	100	00:00:46
3	1009	Black Westeros	Escuela Técnica Roberto Rocca	100	-	-	-	-	100	00:00:50
4	1014	Dragonbots	CONALEP Miguel Alemán	80	PKDG	-	-	-	80	00:00:52
5	1001	Negro Cap	COBACH Puerto Peñasco	-	-	-	-	-	0	00:00:00
6	1002	E-Hawks	Universidad Autónoma de la Laguna	-	-	-	-	-	0	00:00:00
7	1008	LAMBOT 34	PrepaTec San Luis	-	-	-	-	-	0	00:00:00
8	1004	Computaritos	PrepaTec Sábila	-	-	-	-	-	0	00:00:00
9	1006	Overture I - Prepa TEC	PrepaTec Cumbres	-	-	-	-	-	0	00:00:00
10	1007	Tectronic01	PrepaTec Cejaya	-	-	-	-	-	0	00:00:00

Figure 1. Virtual Scoreboard

Figure 2 shows the detailed view for each score cell in the Virtual Scoreboard. As stated before, it shows information about the thematic station, the team, notes from the judge (which could be the number of restarts used, or multiple-task run points granted), as well as a video reproducer to watch the video submitted by the team and evaluated by the judge.

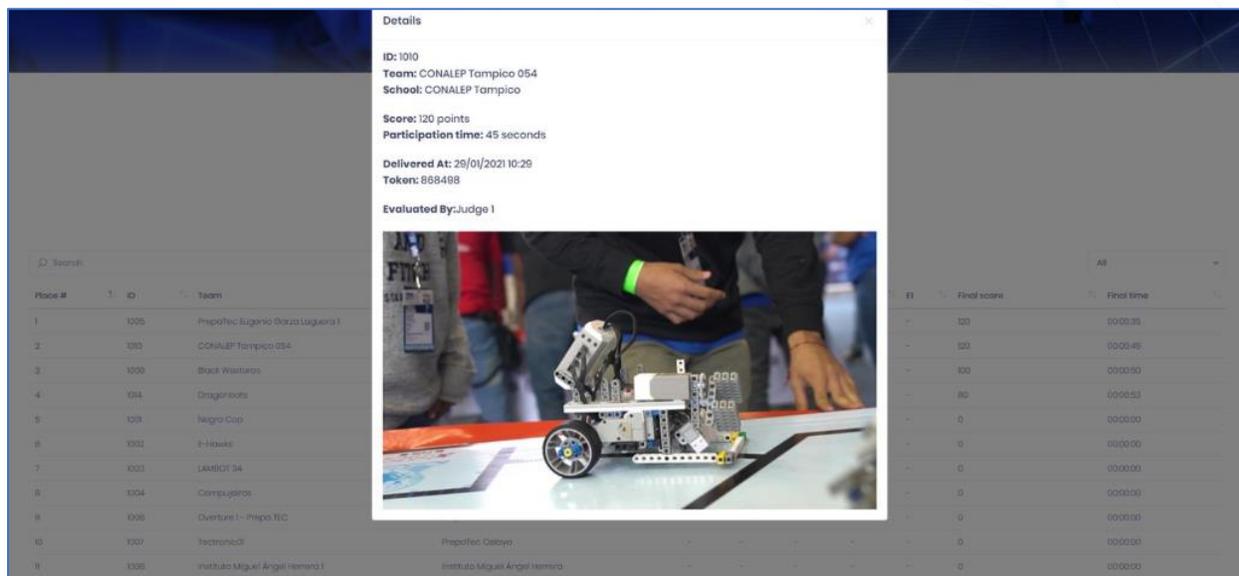


Figure 2. Test Detail View

9. Infringements and Penalties

Judges are allowed to penalize teams that commit infringements during the tournament.

There are three types of penalties a judge can assign to a team depending on the gravity of the infringement, which are:

1. **Warning:** This is a notice to the team that they are misbehaving in some way. Getting more than 3 warnings may result in the team's disqualification.
2. **Invalid run:** This penalty nullifies the run of the team, therefore giving them a score of zero (0) for that run, adding one (1) to their restart count and making them have to repeat the run.
3. **Disqualification:** This is the greatest penalty of all. The team is suspended from the competition, their score is set to zero (0), and the team member(s) responsible shall not be able to compete in a WER Contest again.

Infringement	Penalty
A member of the team has contact with the robot during a run without asking for a restart.	1. A restart is added to the team's restart count.
A member of the team tries to aid the robot to complete a task or correct its trajectory inside the arena during a run.	1. Warning 2. Run invalidated
A robot is built using materials from the SK201-2020T task building kit or any material outside the Krypton kit.	1. Run invalidated
A member of the team tries to interfere with the participation of another team in any way, shape or form.	1. Warning 2. Possible disqualification
A team member physically or verbally harasses any of their teammates, members of other teams or competition staff.	1. Warning 2. Possible disqualification
The team uses an electronic device to receive or transfer information about the competition to another team or outsider.	1. Warning
The team receives help from their coach, another team or an outsider during any time of the competition.	1. Warning 2. Run invalidated

10. Tech Support

As stated before, during the synchronous stage, teams will be assigned to a group and a videoconference room with a judge. Another role for the judge inside this videoconference room is providing technical support to the teams.

- Tech support is not intended to help with questions about the program in any way, shape or form.
- Tech support is not intended to help with questions about the design of the robot in any way, shape or form.
- Tech support is limited to explaining procedures and tests the contestants may try with their robot to assess the correct function of their components (sensors, motors & controller).
- Time spent during the assessment of the components will not be compensated to the team.

To prevent spending too much time with technical support assessment, we recommend that each team have a spare parts kit to replace any defective components during the competition and contact the tech support team after the competition to assess the components without time pressure.

During the physical tournament, there will be a special area designated for technical support with spare parts to borrow in case of a defect.