This competition is about imagining amazing solutions for the future while using your curiosity and creativity!
IDEAA Challenge 2020:
Design a Charging Station for Mars that utilizes renewable energy on that planet, and is used to recharge rovers, drones, or any other robotic device envisioned by the team.

Challenge Overview
Teams will be judged based on the combination of two scores: participation and deliverables. The participation score will account for 15% of the final score, and the deliverables score will comprise the remaining 85% of the final score.

Participation points will not be graded. They will be awarded for attendance and participation in IDEAA Challenge workshops that will be offered throughout the competition period.

Deliverables will be graded based on design novelty, feasibility, and accessibility as well as the quality of presentation. Scoring guidelines are included in this document.

Scoring Overview

<table>
<thead>
<tr>
<th>Participation</th>
<th>15 points</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 workshops @ 5 points each</td>
<td>15 points</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Deliverables</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Milestone 1</td>
<td>20 points</td>
</tr>
<tr>
<td>Milestone 2</td>
<td>20 points</td>
</tr>
<tr>
<td>Final Prototype Design Report</td>
<td>20 points</td>
</tr>
<tr>
<td>Final Prototype Design Presentation</td>
<td>25 points</td>
</tr>
</tbody>
</table>

Workshop Participation
Team members and their coaches will be eligible to attend workshops where they will learn skills needed to complete the challenge. Teams will receive 5 points for attendance at up to 3 discrete workshops over the course of the challenge. At least one student from the team must be present to receive points for a workshop.
Workshop Dates

Workshop 1: Prototyping Workshop
Saturday, February 22, 2020: 1:00 – 2:30pm

Workshop 2: Project Management Workshop
Saturday, March 14, 2020: 1:00 – 2:30pm

Workshop 3: Financial Management Workshop
Saturday, March 28, 2020: 1:00 – 2:30pm

Deliverables

For milestones 1 and 2, teams should submit 5-page reports and a 10-slide (PowerPoint) deck that addresses each of the items listed below.

The final design report should be between 15-25 pages with figures and charts included in the body of the report. Title page and reference pages do not count toward the total page count. Report should be written using a 12 pts size font and 1.5-line spacing. Teams will have 10 minutes to present their final design and prototype at the April 25th Final Competition event. All deliverables must be submitted by 11:59pm of the deadline in order to aspire to full points. Deliverables submitted after the due date will result in a 2 pts. deduction for each day they are late.

Deliverable Submissions

Please upload deliverables to Portfolium, and also submit them via email to challenge@scienceinnovations.org

Contact Information

For any questions or concerns, please send an email to challenge@scienceinnovations.org or call (317) 703-7836

IDEAA Challenge Finals!
Your time to shine on stage!
Milestone 1: 20 points total  
February 10, 2020

Problem Identification: 5 points
- Research
- Customer Survey
- Others

Benchmarking and Screening: 10 points
- Research existing products
- Reverse engineering existing products.

Feasibility Studies: 5 points
- Technical Analysis
- Economic/Strategic Analysis
- Project Budget Proposal

Milestone 2: 20 points total  
March 8, 2020

Product Design: 10 points
- Specifications
- Preliminary Designs

Failure Load Analysis: 5 points

Basic Prototype Design: 5 points

Final Prototype Design Report: 20 points  
April 5, 2020

Prototype Testing: 10 points
- Accuracy Studies
- Failure mode studies
- Applicability analysis

Product Roll-out Plans: 10 points
- Intellectual Property protection plan
- Production plan
Final Prototype Design Presentation: 25 points

- 10 minutes presentation of your work, your design, and prototype.
- This presentation will be judged based on given scoring guidelines that evaluates novelty, feasibility and accessibility of the idea being proposed; in addition to the quality of the presentation.

Eligibility

Students enrolled in 9th through 12th grade in an Indiana high school or Indiana homeschool during the IDEAA Challenge are eligible to compete. All team members must complete the registration at https://form.jotform.com/9255512201145 and sign an acknowledgement of receipt of challenge rules (the final page of this document) before a team’s work will be considered for the challenge.

Budget

The budget for prototypes may not exceed $600. The IDEAA Challenge will reimburse up to $300 of the project cost with the submission of receipts. Teams have the option of fundraising an additional $300 for their prototypes. Teams will be expected to submit documentation of additional fundraising campaigns and project budgets documenting the total expense of their prototype research and development. Projects that exceed $600 will be disqualified.

Coach

The coach’s role during the challenge is to provide guidance for teams. Coaches may help teams identify problems/weaknesses of team designs, identify resources for teams to reference and/or use for their projects, assist teams in understanding reference/research materials, and assist teams with project management and conflict resolution. Coaches may not identify solutions for technical problems that arise during the challenge.

Portfolium

Each student participant will have access to a Portfolium account to document and share their work from this competition as well as other projects. Milestone and final project requirements must be submitted through Portfolium. Each team must select one student who will be responsible for uploading the required documents. Judges will use Portfolium to score each team’s submissions based on the rubric. Students can create a Portfolium account at https://portfolium.com/

Portfolium help and resources are available at https://help.portfolium.com/en/collections/53619-portfolium
Intellectual Property

Research for the IDEAA Challenge may produce findings that are the Intellectual Property (IP) of the entrant. Participation in the IDEAA Challenge requires disclosure of methods and results; they will be made available to our evaluators and judges. Results and methods may be made available to the public in the promotion of the project. If entrants are concerned about the protection of IP, they are urged to consider these issues with their coaches and qualified adult advisors to make an informed decision before entering the IDEAA Challenge. The exhibition, posting, and judging process will not be modified in deference to journal embargoes or other considerations.

Academic Integrity

The IDEAA Challenge, like colleges and universities across the nation, expects that students hold themselves to rigorous ethical standards, both academic and personal. Responsibility for integrity in scholarship is inherently the scholar’s. Students must be responsible for all aspects of their work’s authenticity: the research, the application, and all other documentation. Teams will be asked to submit a signed statement attesting that all material submitted is exclusively the work of the students in substance and in presentation. Any substantive contribution by team coaches or mentors must be clearly identified in the team’s documentation. If a determination is made at any point that an entrant has violated rules as outlined in this document or at the discretion of the IDEAA Challenge team, and/or misrepresented work or attribution thereof, the IDEAA Challenge reserves the right to disqualify the entry, withhold and/or withdraw monetary awards and/or exclude the entrant from participating in IDEAA Challenge programs.

Cash Rewards

The top three teams will be rewarded cash prizes. The team with the highest final score will receive $3000. The second place team will receive $2000 and the third place team will receive $1000. In the case of a tie, prize money may be combined and distributed evenly among the tied teams. Ultimately the distribution of $6000 in prizes is at the discretion of our team of judges. Members of winning teams may be asked to submit tax forms before prize money is distributed.

Grievances

If an adult or student entrant wishes to share a grievance or a suspected violation of IDEAA Challenge eligibility or research related rules, they should email their concern to challenge@scienceinnovations.org.
Helpful Resources

**Project Management Methodology Overview**

- **Define Project**: Understand and document what your challenge project really entails
- **Define goals and objectives**: Establish goals and objectives that need to be accomplished. Goals tell you “what needs to happen” and setting Objectives will guide you “how to make it happen”.
- **Define tasks**: Clearly define the tasks involved to complete the project
- **Build your team**: Define roles and responsibilities
- **Identify risks**: Use predictive reasoning to define potential roadblocks. Account for any unforeseen problems.
- **Assign tasks to team members and create a timeline**: Create a roadmap with weekly deliverables and 15-minute standups
- **Get Feedback and adjust your plan accordingly**: Continuously evaluate the plan as a team and ensure the plan is flexible to account for any risks materializing as issues

**Other Project Management Resources:**

http://www.ProjectManagementDocs.com
https://www.scrumhub.com/
https://www.pmi.org/learning/tools-templates
http://www.pmclounge.com

**Guidelines for Writing a Team Contract**

According to concepts from Organizational Behavior, there are five stages of team development: forming, storming, norming, performing, and adjourning. During the **forming** stage, teams tend to communicate in indirect polite ways rather than more directly. The **storming** stage, characterized by conflict, can be often be productive, but may consume excessive amounts of time and energy. In this stage it is important to listen well for differing expectations. Next, during the **norming** stage, teams formulate roles and standards, increasing trust and communication. This norming stage is characterized by agreement on procedures, reduction in role ambiguity, and increased “we-ness” or unity. These developments generally are precursors to the **performing** stage, during which teams achieve their goals, are highly task oriented, and focus on performance and production. When the task has been completed, the team **adjourns**.

To accelerate a team’s development, a team contract is generated to establish procedures and roles in order to move the team more quickly into the performing stage. This process of generating a team contract can actually help jump-start a group’s collaborative efforts by immediately focusing the team members on a definite task. The group members must communicate and negotiate in order to identify the quality of work they all wish to achieve,
and the level of group participation and individual accountability they all feel comfortable with.

Successful team performance depends on personal individual accountability. In a team environment, individuals are usually effectively motivated to maximize their own rewards and minimize their own costs. However, conflicts can arise when individualistic motives or behaviors disrupt team-oriented goals. For example, conflict can stem from an unequal division of resources. When team members believe they are receiving too little for what they are giving, they sometimes reduce their effort and turn in work of lower quality. Such “free riding” occurs most frequently when individual contributions are combined into a single product or performance, and individual effort is perceived as unequal. At this point, some individual team members may take on extra responsibilities while other team members may reduce their own efforts or withdraw from the team completely. These behaviors may engender anger, frustration, or isolation—resulting in a dysfunctional team and poor quality of work. However, with a well-formulated team contract, such obstacles can usually be avoided

Your team contract template is divided into three major sections:

1. establishing team procedures
2. identifying expectations
3. specifying the consequences for failing to follow these procedures and fulfill these expectations

Since the basic purpose of this team contract is to accelerate your team’s development, to increase individual accountability for team tasks, and to reduce the possibility for team conflict, make your contract as specific as possible: (a) specify each task as detailed as possible, (b) specify each step in a procedure or process as detailed as possible, (c) specify the exact person(s) responsible for each specific task, and (d) specify the exact time and exact place for completion or submission of each task. The more specifically you describe your team expectations, roles, and procedures, the greater chance you have for a successful team experience.

Use the Team Contract template to discuss and finalize your team roles, procedures, and standards.

Once your team contract has been developed, your team is ready to begin work on the challenge. However, you may soon find that your team is not working as well as you had hoped. This is normal, but needs to be attended to immediately. Perhaps your team is simply not following the established contract procedures or roles as strictly as you should be, or perhaps you need to change some of the procedures or roles as outlined in your contract. Call a team meeting immediately to discuss and resolve the challenges your team is facing; do not delay. Seek guidance from your coach to resolve any conflicts so that you will have the most positive team experience possible.
TEAM CONTRACT TEMPLATE

Team Members:
1) ______________________________
2) ______________________________
3) ______________________________
4) ______________________________

Team Procedures

1. Day, time, and place for regular team meetings:

2. Preferred method of communication (e.g., e-mail, cell phone, wired phone, Google Chat, face-to-face, in a certain class) in order to inform each other of team meetings, announcement, updates, reminders, problems:

3. Decision-making policy (by consensus? by majority vote?):

4. Method for setting and following meeting agendas (Who will set each agenda? When? How will team members be notified/reminded? Who will be responsible for the team following the agenda during a team meeting? What will be done to keep the team on track during a meeting?):

5. Method of record keeping (Who will be responsible for recording & disseminating minutes? How & when will the minutes be disseminated? Where will all agendas & minutes be kept?):

Team Expectations

Work Quality

1. Project standards (What is a realistic level of quality for team presentations, collaborative writing, individual research, preparation of drafts, peer reviews, etc.?):

2. Strategies to fulfill these standards:
Team Participation

1. Strategies to ensure cooperation and equal distribution of tasks:

2. Strategies for encouraging/including ideas from all team members (team maintenance):

3. Strategies for keeping on task (task maintenance):

4. Preferences for leadership (informal, formal, individual, shared):

Personal Accountability

1. Expected individual attendance, punctuality, and participation at all team meetings:

2. Expected level of responsibility for fulfilling team assignments, timelines, and deadlines:

3. Expected level of communication with other team members:

4. Expected level of commitment to team decisions and tasks.

Consequences for Failing to Follow Procedures and Fulfill Expectations

1. Describe, as a group, you would handle **infractions** of any of the obligations of this team contract:

2. Describe what your team will do if the infractions continue:

***************************************************************************

a) **I participated in formulating the standards, roles, and procedures as stated in this contract.**

b) **I understand that I am obligated to abide by these terms and conditions.**

c) **I understand that if I do not abide by these terms and conditions, I will suffer the consequences as stated in this contract.**

1) __________________________________________ date________________

2) __________________________________________ date________________

3) __________________________________________ date________________

4) __________________________________________ date________________
Possible Roles on Teams

Student teams often function most effectively when members have designated roles. The roles you assign will depend on the goals of the assignment, the size of the team, etc. They can be fixed or rotating.

Here are some possible group roles, but the list is not exhaustive. Think creatively and come up with your own!

Facilitator: Moderates team discussion, keeps the group on task, and distributes work.

Recorder: Takes notes summarizing team discussions and decisions, and keeps all necessary records.

Reporter Serves as group spokesperson to the class or instructor, summarizing the group's activities and/or conclusions.

Timekeeper Keeps the group aware of time constraints and deadlines and makes sure meetings start on time.

Devil's Advocate Raises counter-arguments and (constructive) objections, introduces alternative explanations and solutions.

Harmonizer Strives to create a harmonious and positive team atmosphere and reach consensus (while allowing a full expression of ideas.)

Prioritizer Makes sure group focuses on most important issues and does not get caught up in details.

Explorer Seeks to uncover new potential in situations, people (fellow team members but also clients), and explore new areas of inquiry.

Innovator Encourages imagination and contributes new and alternative perspectives and ideas.

Checker Checks to make sure all group members understand the concepts and the group's conclusions.

Runner Gets needed materials and is the liaison between groups and between their group and the instructor.

Wildcard Assumes the role of any missing member and fills in wherever needed.
Sources

Team roles are adapted from lists in:


Team contract was adapted from the math department at the College of Natural Sciences, University of Texas at Austin:

https://cns.utexas.edu/images/CNS/TIDES/teaching-portal/Team_Contract.doc

Some challenge rules were adapted from the rules of the Regeneron Science Talent Search:

### Scoring Guidelines

**Milestone 1 (20 points)**

<table>
<thead>
<tr>
<th>Section</th>
<th>Requirements</th>
<th>Scoring Guidelines</th>
<th>Max. Points</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Problem Identification</strong></td>
<td>A problem statement, and at least one (1) slide.</td>
<td>A clearly defined and grammatically correct statement in the form of a question, hypothesis, or sentence. The statement mentions a product that addresses the two topics of this challenge: renewable energy and a charging station on Mars. Provides a list with at least 1 potential stakeholder.</td>
<td>5</td>
</tr>
<tr>
<td><strong>Research Existing Products</strong></td>
<td>At least one (1) page with at least three (3) references. At least two (2) slides.</td>
<td>Research connects with problem identification statement. Team has identified useful tools for solving the problem. Team has identified gaps in existing technology to maximize the impact or novelty factor of the project.</td>
<td>5</td>
</tr>
<tr>
<td><strong>Reverse Engineer Existing Products</strong></td>
<td>At least two (2) pages of narrative including at least two (2) figures documenting your reverse engineering process. At least two (2) slides.</td>
<td>Narrative describes why the existing product was chosen, and how it was reverse engineered. It should include at least one (1) figure of the product before and at least one (1) figure of the product after the reverse engineering exercise.</td>
<td>5</td>
</tr>
<tr>
<td><strong>Feasibility Studies</strong></td>
<td>At least one (1) page narrative identifying challenges or things that may happen outside the plan that may affect the design or prototyping of your product, and how the team will prepare for that. At least two (2) slides.</td>
<td>Identify two (2) challenges and provide one (1) plan to mitigate each challenge.</td>
<td>5</td>
</tr>
</tbody>
</table>
### Milestone 2 (20 points)

<table>
<thead>
<tr>
<th>Section</th>
<th>Requirements</th>
<th>Scoring Guidelines</th>
<th>Max. Points</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Product Design Specifications</strong></td>
<td>At least two (2) pages and at least two (2) slides including at least two (2) figures.</td>
<td>At least two (2) pages specifying materials and technology needed to create the product. At least two (2) figures that illustrate the product (e.g. sketch or CAD), specify materials used, product dimensions, and weight.</td>
<td>5</td>
</tr>
<tr>
<td><strong>Preliminary Product Design</strong></td>
<td>At least one (1) page describing the product design from the functionality point of view. At least two (2) slides.</td>
<td>At least one (1) page that describes how the product will solve the identified problem. Figures are optional.</td>
<td>5</td>
</tr>
<tr>
<td><strong>Failure Load Analysis</strong></td>
<td>At least one (1) page describing the process of collecting and analyzing data to determine potential failures. At least two (2) slides.</td>
<td>At least one (1) page including one (1) figure that describes and interprets failure load analysis. Team uses and cites particular physical or mathematical models.</td>
<td>5</td>
</tr>
<tr>
<td><strong>Basic Prototyping Design</strong></td>
<td>At least one (1) page, including one (1) figure, describing scope and scale of product prototype as well as materials and techniques to be used. At least two (2) slides.</td>
<td>At least one (1) page specifying materials and technology needed to create a prototype. At least one (1) figure that specifies materials used and prototype dimensions (which should be at scale).</td>
<td>5</td>
</tr>
</tbody>
</table>
### Final Prototype Design Report (20 points)

<table>
<thead>
<tr>
<th>Section</th>
<th>Requirements</th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Accuracy Studies</strong></td>
<td>At least three (3) pages describing the accuracy of product development.</td>
<td>At least three (3) pages that describe tests and outcomes used to determine accuracy of product or prototype compared to design goals.</td>
<td>4</td>
</tr>
<tr>
<td><strong>Failure Mode Studies</strong></td>
<td>At least three (3) pages, including at least one (1) figure, describing processes by which possible failure modes of product design or manufacturing were analyzed.</td>
<td>At least three (3) pages, including at least one (1) figure, that describes method by which failure modes (at least one) were evaluated and findings of this study. This section provides plans to mitigate failures.</td>
<td>4</td>
</tr>
<tr>
<td><strong>Applicability Analysis</strong></td>
<td>At least three (3) pages, including at least one (1) figure, describing applicability of product to given challenge.</td>
<td>At least three (3) pages, including at least one (1) figure, that provide applicability of product to the challenge of utilizing renewable energy on Mars in order to charge a remote robotic device (e.g. drone, rover). This section includes details specific to the process of charging a robotic device through a charging station.</td>
<td>4</td>
</tr>
<tr>
<td><strong>Intellectual Property Protection Plan</strong></td>
<td>At least three (3) pages, including at least one (1) figure, describing a plan to protect potential intellectual property.</td>
<td>At least three (3) pages, including at least one (1) figure, that provide references to existing patents or laws that affect your product development. The narrative includes how they plan to protect their intellectual property (e.g. a draft of a non-disclosure agreement).</td>
<td>4</td>
</tr>
<tr>
<td><strong>Production Plan</strong></td>
<td>At least three (3) pages, including at least one (1) figure, describing the creation and monitoring of the output of product.</td>
<td>At least three (3) pages, including at least one (1) figure, that provides a manufacturing plan for product and includes logistics and efficiency of resources. This section establishes benchmarks for production efficiency.</td>
<td>4</td>
</tr>
</tbody>
</table>
## Final Prototype Design Presentation (25 points)

<table>
<thead>
<tr>
<th>Section</th>
<th>Requirements</th>
<th>Scoring Guidelines</th>
<th>Max. Points</th>
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</thead>
<tbody>
<tr>
<td>Novelty</td>
<td>At least two (2) minutes of final presentation including slides that describe product novelty.</td>
<td>Presentation and slides clearly and logically explains novelty of product in a way that the audience can understand.</td>
<td>5</td>
</tr>
<tr>
<td>Feasibility</td>
<td>At least two (2) minutes of final presentation including slides that describe product feasibility.</td>
<td>Presentation and slides logically explains feasibility of product in a way that the audience could understand.</td>
<td>5</td>
</tr>
<tr>
<td>Accessibility</td>
<td>At least two (2) minutes of final presentation including slides that describe product accessibility.</td>
<td>Presentation and slides logically explains accessibility of product in a way that the audience could understand.</td>
<td>5</td>
</tr>
<tr>
<td>Quality of Presentation</td>
<td>A 10-minute final presentation, including slides, that accurately describes the problem, product and work done, in a professional manner.</td>
<td>Presentation was completed on time and followed a logical order that the audience could understand, students and demonstrated knowledge of content.</td>
<td>5</td>
</tr>
<tr>
<td>Effectiveness of Presentation</td>
<td>Final presentation that effectively sells product idea to target audience.</td>
<td>Presentation provides compelling reason for the use of this product and questions are answered in an effective manner.</td>
<td>5</td>
</tr>
</tbody>
</table>
Spelling and Grammar Errors

It is expected that all submissions are free of spelling and grammar errors.

<table>
<thead>
<tr>
<th>Errors per Submission</th>
<th>1-2</th>
<th>3-4</th>
<th>5-6</th>
<th>7-8</th>
<th>8+</th>
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</thead>
<tbody>
<tr>
<td>Point Deduction per Submission</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Workshop Participation

At least one team member must be present and participate in a workshop to receive points.

<table>
<thead>
<tr>
<th>Workshop</th>
<th>1</th>
<th>2</th>
<th>3</th>
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</thead>
<tbody>
<tr>
<td>Points per Participation</td>
<td>5</td>
<td>5</td>
<td>5</td>
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</table>