The National Science Foundation and the
American Association of Community Colleges present

Participants' Guide

2016-2017

National Science Foundation

AMERICAN ASSOCIATION OF COMMUNITY COLLEGES

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ABOUT THE COMMUNITY COLLEGE INNOVATION CHALLENGE

Are you a community college student who has a fresh idea that uses science, technology, engineering or math (STEM)? The National Science Foundation (NSF) and the American Association of Community Colleges (AACC) invites you to enter the third annual Community College Innovation Challenge (CCIC) that asks teams to create a STEM-based solution to a real-world problem.

The United States leads the world in scientific discovery and innovation. NSF and AACC are calling on community college students -- the nation's future scientists and engineers -- to support U.S. scientific progress through the CCIC. CCIC provides students with an opportunity to begin using science to make a difference in the world by transferring knowledge into action.

This year, teams will submit projects using one of three themes: Maker to Manufacturer, Energy and Environment, and Security Technologies. NSF and AACC are calling for three to five U.S. community college students to form teams with a faculty mentor and a community and/or industry partner to participate in the competition. An entry consists of a written portion and a 90-second video. Visit the Promotional Toolkit, where you can download competition posters, postcards and more. The boot camp is a professional development workshop aimed to build entrepreneurial skills relevant to innovation in both the private and public sectors.

Who: Teams of three to five community college students, a faculty mentor, and a community or industry partner.

What: Teams proposing innovative, STEM-based solutions for real-world problems they identify within one of three themes:

- Maker to Manufacturer.
- Energy and Environment.
- Security Technologies.

When: Submission window: **Oct. 14, 2016, to 11:59 p.m. EST, Feb. 15, 2017**.
Required Innovation Boot Camp for finalists in Arlington, Va.: **June 12, 2017, to June 15, 2017.**

Where: Visit www.nsf.gov/CCchallenge.

Why: To foster the development of crucial innovation skills, win prizes and professional development.

More questions? Contact the CCIC team at InnovationChallenge@nsf.gov.
Follow the challenge: #CCIChallenge.

THEMES

There are three themes to choose from when preparing your application to the 2016-2017 Community College Innovation Challenge (CCIC). Brief summaries about the themes are provided below, along with some resources for your reference. In preparing your submission, please note that your team is **not** required to have implemented your innovation or have advanced datasets in order to submit an entry.

However, as part of your entry, your team **is** required to:

Assess the innovation's potential impact.
Determine the scientific feasibility and societal relevance of the project.
Identify any potential challenges and ways to work through them.
Share ideas for how the innovation would be implemented in a real-world scenario. Start thinking of yourselves as entrepreneurs with a new invention you want to sell in the marketplace!

Theme 1 – Maker to Manufacturer: The Maker Movement, described as the democratization of engineering, enables people of all ages and educational levels to design and produce devices and products that fit specific personal needs. Manufacturing these products on a small scale (1000 units or less), while advantageous due to the reduction in waste and increase in manufacturing efficiency, does not fit into the current manufacturing infrastructure of the United States.

In recent years, the variety and value of manufactured products an individual or small team can design and prototype has increased due in large part to software advances and tabletop tools such as 3-D printers—along with lower cost of these systems. In addition, computer-aided design and manufacturing (CAD/CAM) software has made it easier for people to design and fabricate products without having to know programing languages. These examples, as well as the growth of shared makerspaces, fab labs, hackerspaces, and both online and local communities of interest, offer a diverse array of resources for makers to make a transition to small-scale manufacturing of their products. However, these tools and methods for small-scale manufacturing are not widely available or commonly found together.

This theme considers the development of innovative methods and/or products that can provide solutions to address the typical hurdles involved in small-scale manufacturing, which include but are not limited to, the identification of:

Useful design software and the accompanying hardware for production.
Local value chains for potential products.
Challenges around financing small-batch manufacturing.
Intellectual property considerations.
Construction and assembly skills to bring a product out of the concept and prototype stages and into the market stage.

Your innovation should help to share current manufacturing knowledge and resources among the maker community, and be useful toward improving a user's knowledge of manufacturing.

Here are a few examples of how a CCIC team might approach solving this knowledge and resource accessibility problem:

• Expand access to practical design and manufacturing skills by capturing and sharing the process know-how of shop-floor machinists and engineers, using, for example, simulations and online videos or incorporating such knowledge into easy-to-use apps.

• Develop a set of design rules and heuristics for "design for manufacturability in the U.S.," by identifying and eliminating labor-intensive steps that would make it difficult to manufacture something in the U.S. at a small scale.

Resources:

Examples of existing maker resources include platforms that simplify product design and manufacturing (e.g., Britehub, Plethora, OpenDesk), manufacturing services (e.g., Shapeways, Ponoko, Materialise, Sculpteo, 3D Hubs, Proto Labs, Tempo Automation), and various communities of interest (e.g., DIYDrones for drones, e-Nable for low-cost prosthetics).

Advanced Manufacturing: Made to Order:
https://www.nsf.gov/eng/special/madetoorder/

Engineering for All:
https://www.nsf.gov/discoveries/disc_summ.jsp?cntn_id=131735&org=NSF

Learning Through Making:
https://www.nsf.gov/discoveries/disc_summ.jsp?cntn_id=131761&org=NSF

Other Manufacturing Resources:

http://additivemanufacturing.com/tag/president-obama/

https://www.nist.gov/news-events/news/2012/08/national-additive-manufacturing-innovation-institute-announced
https://www.manufacturing.gov/nnmi-institutes/

Theme 2 – Energy and Environment: A sustainable world is one in which human needs are met equitably without harm to the environment, and without sacrificing the ability of future generations to meet their needs. The creation of a secure and prosperous future for humanity depends on the contributions that science, engineering and education will make towards building sustainable pathways to meet the energy needs of future generations.

The Energy and Environment theme calls for STEM-based projects that develop innovative approaches to sustainability pathways. This theme asks for scalable, sustainability innovations that are designed to improve and work well in the context of relevant technologies and environmental, economic and social systems.

The following topic areas illustrate the broad areas of focus that can be addressed under this theme:
Bio-inspired energy and sustainability solutions.
Energy and environmental solutions.
Sustainable urban infrastructure solutions.

Sustainable tools for scientific discovery.
Sustainable manufacturing solutions.
Sustainable communication infrastructure.
And more.

Resources:

NSF Special Report "High-Tech Harvest:
https://www.nsf.gov/eng/special/hightechharvest

NSF-funded Sustainable Cities Site:
http://www.rcnsustainablecities.com/
Colorado Water Innovation Cluster (additional resources in resource tab):
http://www.co-waterinnovation.com/initatives/

NSF-funded Sustainable Healthy Cities Project:
http://www.sustainablehealthycities.org/about/
Arizona State University Global Institute of Sustainability:
http://sustainability.asu.edu/research/project/rcn-sees_for_urban_sustainability_research_coordination_and_synthesis_for_a_transformative_future/

Theme 3 – Security Technologies:

Making cyberspace secure and trustworthy is one of the most important challenges confronting society today. The fragility and vulnerability of cyberspace has exposed societies and individuals to untold risks with severe consequences on a global scale. Achieving a more secure cyberspace demands overcoming significant scientific challenges, and realizing privacy and trust in cyberspace requires a delicate balancing of technology with human and societal needs. Recognizing future advances in technologies for cyberspace, changes in society and adoption in new domains will necessitate a rethinking of the relationships among security, privacy and trust in cyberspace.

In today's increasingly networked, distributed and asynchronous world, cybersecurity involves hardware, software, networks, data, people and integration with the physical world. Achieving a truly secure cyberspace requires addressing both challenging scientific and engineering problems involving many components of a system, and vulnerabilities that arise from human behaviors and choices. Examining the fundamentals of security and privacy as a multidisciplinary subject can lead to new ways to design, build and operate cyber systems; protect existing infrastructure; and motivate and educate individuals about cybersecurity.

This theme seeks submissions for original, practical methods to design, build, analyze and operate cyber systems that are secure, private and usable. Topics of interest include techniques to reason about and predict system security trustworthiness, including formal models, observable metrics, analytical methods, simulations, experimental deployment and, when reasonable and safe, deployment on live testbeds for experimentation at scale. Your project can address the trade-offs among trustworthy computing properties, such as security and usability or accountability and privacy, as well as work that examines the tension between security and human values, such as openness and transparency. We also

welcome innovations that advance the creation, management, robust understanding and intelligent analysis of data and information that address the cybersecurity challenge.

Resources:

The National Initiative for Cybersecurity Education:
https://niccs.us-cert.gov/
https://niccs.us-cert.gov/research/resource-links-education

Cyber Aces (free courses, tutorials and career info):
http://www.cyberaces.org/

This op-ed by an NSF-funded researcher helps explain the sociotechnical aspects of cybersecurity research:
https://theconversation.com/cybersecuritys-weakest-link-humans-57455

A blog about the White House's Cybersecurity R&D Strategic Plan:
https://www.whitehouse.gov/blog/2016/02/08/national-challenges-and-goals-cybersecurity- science-and-technology

NSF Cybersecurity Special Report:
https://www.nsf.gov/news/special_reports/cybersecurity/

ENTRY GUIDELINES

A complete entry consists of two components: a written entry and a video entry, described below. Before entering through the online platform (the portal where you'll submit your entry, accessible through nsf.gov/CCchallenge), teams should review the entire participants' guide. When registering for the competition using the online platform, the faculty mentor must initially register their team and invite all team members to join. All team members must then join (including the community/industry partner) and provide the required personal information. Any team member can then submit the team's entry.

Written Entry

The written entry will be submitted on the challenge platform in the three sections detailed below. Each section has a 1,600-character limit, including spaces. In addition, each team will be asked to provide up to a 500-character layperson summary of your project. This should be succinct and say what your project is and why it matters.

- **The Problem.** Clearly and succinctly define the problem of interest. Provide relevant background information and identify the context of the problem (i.e., who is affected, how long has the problem existed). Indicate why it is important that this problem be solved, as well as the impact if the problem were to continue without intervention.
- **The Solution.** Describe your team's innovative solution. What science and/or technology underlie the solution? Is your solution scientifically feasible? What challenges or barriers must be overcome to make the solution a reality?

- **Impacts and Benefits.** Describe how your team would measure the impact and benefits of your solution, if implemented. The benefits for science, industry, society, the economy, national security and/or other applicable areas must be addressed.
- **Role of the Community/Industry Partner.** Briefly describe how your community/industry partner has been involved in your project. How have they assisted your team in identifying potential opportunities and challenges?

Video Entry

The video entry should consist of a single, 90-second video.

- The video should be used to clearly articulate the problem; explain what could happen if the problem is not resolved; and your team's proposed solution. The video entry should have a unified voice, vitality and energy, and should emphasize new methods and insights not provided in the written entry to create a novel presentation, while telling a compelling story. A successful entry will be visually striking and will be captured and edited to a high standard. The video entry should also deliver clear and understandable messages using nontechnical language.
- Videos do not have to include credits but if they do, these will be included in the 90-second time limit.
- Teams must upload their video submissions to YouTube, provide a link to the video on the entry form and submit their video file (a MOV file recorded in HD at a minimum resolution of 1280 x 720) via the entry form.

PROCESS AND PRIZES

Entry Submission

Register on the CCIC platform. Remember, the faculty mentor must initially register their team and invite all team members to join. All team members must then join (including the community/industry partner) and provide the required personal information. Any team member can then submit the team's entry.

Complete entry form

Upload required images, videos and forms

Submit completed entry before submission deadline

Scoring and Judging Criteria

1. All entry/team members will be screened for compliance with the rules and eligibility requirements.
2. Each entry will be evaluated anonymously based on the criteria on page 9 and will be assigned a numerical score by each judge.
3. Up to 30 teams will become semifinalists following the preliminary round of judging. If insufficient entries are received, NSF and AACC reserve the right to adjust the number of semifinalists or eliminate the judging round altogether. Teams will be notified if they have progressed to the semifinal round by email.

4. A separate panel of judges will evaluate all semifinalist entries based on the same judging criteria used in the first round. Up to 10 highest scoring entries will be selected for the final round.
5. Finalist teams will be required to attend a four-day Innovation Boot Camp in Arlington, Va., **June 12, 2017, to June 15, 2017.**

Entries should clearly and succinctly define the identified problem and proposed solution within one of the three themes. Identified problems should include relevant background information that provides context and a justification that explains why solving the problem is important. The video should be engaging to a broad audience and well produced.

Judges will equally weigh the following criteria when scoring the entries:

1. **Innovation and impact.** An assessment of the proposed solution's use of science to address the problem, potential impact (potential to be transformative in the areas of national security, economy, quality of life, education, environment, etc.) and uniqueness (how the proposed solution differs from existing efforts in its use of novel concepts, methods and/or instrumentation).
2. **Feasibility.** An assessment of the likelihood that the solution will work as presented based on scientific laws and theories (can the innovation be replicated?) and relevant economic, political and social issues, etc. Evaluation of the team's recognition of potential barriers and suggestions for ways in which these barriers may be surmounted.
3. **Clarity of communication.** An assessment of the team's adherence to the entry guidelines (written and video entries), as well as grammar, structure, organization of the facts and data, etc. The entry should have a clear, consistent message.

Prizes

Final judging will take place at the Innovation Boot Camp. A first and second place team will be determined over the course of the week during several events, where an expert panel of judges will evaluate teams based on a separate rubric. NSF and AACC reserve the right to adjust prize amounts in case of a tie for first or second place.

First place prize: $1,500 per student team member.
Second place prize: $1,200 per student team member.

Innovation Boot Camp

June 12 to June 15, 2017, in Arlington, Va.

IS a competition where you can earn valuable prizes for persuasively presenting your innovation, how it addresses public needs and the benefits your innovation will bring to society.

IS a fun, immersive experience where you'll learn concepts and skills that you can apply throughout your life, including:

- Innovation and design thinking.

- Entrepreneurship.
- Business planning.
- Strategic communications.
- Stakeholder engagement.
- And more.

IS NOT a technical conference intended to review, evaluate and provide expert advice for improving your specific project's feasibility, viability and scientific merits.

IS a golden opportunity to showcase your project and your college on Capitol Hill and engage with members of Congress and other dignitaries.

IS a networking event where you'll meet other top community college innovators, make new friends and share ideas.

IS a meeting of like-minded peers where you'll get the inside story on other community college finalists' projects and discover their approach to innovation.

IS NOT days of classroom-style lectures.

IS an interactive, hands-on event where you are an active participant.

IS the chance to meet, learn from and interact with successful, accomplished entrepreneurs, business counselors, and communications and identity consultants.

IS a platform for engaging with NSF and AACC and learning more about additional opportunities available to community colleges.

IS a voyage of discovery where you'll come away with new skills and relationships and fresh ideas, approaches, strategies, and disciplines that you'll continue to use long after the boot camp ends.

Additional Innovation Boot Camp Details:

• Students and faculty mentors will have all travel, room and board costs associated with attending the Innovation Boot Camp paid on their behalf. Students and mentors are required to attend. Community/industry partners are encouraged to attend but must pay for their own lodging and airfare.

• Approximately six weeks before attending the boot camp, finalists will receive detailed instructions on how to prepare for the camp and will participate in several webinars to cover all boot camp logistics and required preparation.

Webinar Dates:

Wednesday, April 19, 4:00-5:30 pm ET

Friday, April 28, 4:00-5:30 pm ET

NSF Science Coaching Program for Finalists

Part of the finalists' boot camp preparation includes weekly correspondence for approximately one month with an actual NSF program officer and science policy fellow who are matched to your project. The intended goal of this program is to provide customized science and engineering coaching to finalist teams as they prepare for the boot camp.

RULES

Eligibility

- All entries must be received during the competition submission window from **Oct. 14, 2016, to 11:59 p.m. EST, Feb. 15, 2017**.
- Each team must have three to five student members, a faculty member, who will function as a mentor to the team, and a community/industry partner.
- For teams chosen as finalists, the mentor and students must attend the Innovation Boot Camp in Arlington, Va., **June 12, 2017, to June 15, 2017.** Students and faculty mentors will have all travel, room and board costs associated with attending the Innovation Boot Camp paid on their behalf. Community/industry partners are encouraged (not required) to attend but must pay for their own lodging and airfare.
- Team members must participate in several webinars and do homework prior to the boot camp. Dates for these events and details can be found in the Innovation Boot Camp section (page 9) of this guide and on the website.
- All student team members must be enrolled in a two-year, associate degree-granting institution in the U.S., its territories or its possessions at the time of entry (e.g., the fall 2016 semester or the spring 2017 semester).
- Student team members must be in good standing with their academic institution.
- Teams may not consist of members from multiple institutions.
- Student team members are limited to participating in one team project for this challenge.
- Student and faculty mentor team members must be U.S. citizens, nationals or permanent residents and will be required to check a box on the entry form verifying this status.
- All team members must be at least 18 years of age by Feb. 15, 2017.
- A faculty member may not serve as a mentor for more than one team.
- Faculty mentors will be required to sign a certificate stating that the entry is original and has been independently developed by the student members of the team.
- Teams may not have submitted their innovation to any other competitions.
- Students who attended the Innovation Boot Camp as a finalist/winning team in 2015 or 2016 may not participate again.
- Students who submitted an entry to the 2014-2015 or 2015-2016 CCIC but did not progress to the final round may submit an entry in the 2016-2017 CCIC. Students who progressed to the final round and attended the 2015 or 2016 CCIC Innovation Boot Camp may not apply to the 2016- 2017 CCIC.

Rules

- A contest entry constitutes an agreement to adhere to the rules and stipulations set forth by the contest sponsors.
- Any entrant or entry found in violation of any rule will be disqualified.

- Each team entrant certifies, through submission to the contest, that the entry is their own original, creative work and does not violate or infringe the creative work of others, as protected under U.S. copyright law or patent law.
- By entering the contest, the entrants agree to hold harmless, NSF for all legal and administrative claims to include associated expenses that may arise from any claims related to their submission or its use.
- All judges' decisions are final and may not be appealed.
- Entrants retain all copyright and equivalent rights but give NSF nonexclusive rights to use their names, likenesses, quotes, submissions or any part of their submission for educational publicity and/or promotional purposes. This includes, but is not limited to, website display, print materials and exhibits.
- NSF will not be responsible for any claims or complaints from third parties about any disputes of ownership regarding the ideas, solutions, images or video.
- Winners are responsible for all taxes or other fees connected with the prize received and/or travel paid for by the sponsoring organization.
- Employees, contractors, officers or judges of the sponsoring organizations are not eligible to enter the competition.
- NSF reserves the right for any reason, including but not limited to an insufficient number of qualified entries, to modify or cancel the competition at any time during the duration of the competition.
- Should NSF decide to bring winning contestants to the Washington, D.C., area, or to any other location for promotional and other purposes, expenses paid by NSF will be within the limits set forth in law according to federal travel regulations.
- All contestants agree that they, their heirs and estates shall hold harmless the United States, the employees of the federal government, and all employees of NSF for any and all injuries and/or claims arising from participation in this contest, to include that which may occur while traveling to or participating in contest activities.
- NSF has the final say on any point not outlined in the entry rules.

Frequently Asked Questions

Can entrants be from any community college anywhere in the U.S.? Yes, all student team participants must be enrolled in a two-year, associate degree-granting institution in the U.S., its territories or its possessions at the time of entry (i.e., the fall 2016 semester or the spring 2017 semester). Teams may not consist of students from multiple institutions. Please review the "Rules" section on page 11 for more information.

What is meant by "team" for the purpose of the contest? Teams will consist of three to five student team members, a faculty mentor and a community or industry partner. NSF and AACC encourages teams to be multidisciplinary (comprised of engineers, designers, scientists, planners, businesspeople and more). When registering for the competition using the online platform, the faculty mentor must initially register their team and invite all team members to join. All team members must then join (including the community/industry partner) and provide the required personal information. Any team member can then submit the team's entry.

Can multiple teams from the same community college apply? Yes.

Can a student be on multiple teams? No, each student can only be on one team.

Can a faculty member mentor multiple teams? No.

Is there a specific grade-point average that qualifies a student to be "in good standing"? No, we rely on your own educational institution to determine if you are in good standing.

Does the faculty mentor have to be in a STEM discipline? No, mentors must be full or part-time faculty members in any discipline at a community college.

Who is eligible to be a community/industry partner? Any individual who works in industry or the community including those at a business, school, nonprofit organization, community leader, community center, cultural center, public service agency, government entity or professional society. Partners provide relevant support and/or resources for teams. Please review the "What is a community partner?" page on the website for more information.

What should entrants submit? A complete entry consists of two components: A written entry and a video entry. Please review the "Entry Guidelines" section on page 7 for more information.

Can entrants choose an alternative theme? No, teams must propose an innovative, STEM-based solution for a real-world problem in one of the three themes: Maker to Manufacturer, Energy and Environment, or Security Technologies (See "Themes" on page 4).

What is the length limit for the written entry? The written entry must be submitted in three sections, each of which is limited to 1,600 characters, including spaces. Please review the "Entry Guidelines" on page 7 for more information.

How is a video entry submitted and in what form? Entrants are required to submit a video file (MOV file recorded in HD at a minimum resolution of 1280 x 720) as well as a link to either YouTube or Vimeo.

Does the video have to include credits identifying the video creator and any team members? No, the video does not have to include credits but if it does, these will be included in the 90-second time limit. (The entire video should not be longer than 90 seconds.)

Once an entrant submits a video can they revise it or replace it with another video prior to the Feb. 15 deadline? No, once you submit a video to the contest it is considered a final submission and cannot be revised or replaced. However, you can save your entry on the challenge platform and edit it before submitting.

What characterizes a winning entry? Entries are scored based on innovation and impact, feasibility and clarity of communication. Please review the "Process and Prizes" section on page 8 for more information.

How will semifinalists and finalists be notified? All registered team members will be notified via email. Please review the "Process and Prizes" section on page 8 for more information.

Will information on the Innovation Boot Camp be sent directly to finalists? Yes, finalists will be contacted shortly after the semifinal found of judging concludes and next steps will be relayed. These steps include participating in webinars and doing homework to prepare for the boot camp. Please review the "Innovation Boot Camp" section on page 9 for more information.

Is the Innovation Boot Camp a science and engineering workshop? No, your team will not receive customized science coaching on your project at the boot camp. The boot camp is a professional development workshop aimed to build entrepreneurial skills relevant to innovation in both the private and public sectors. Sessions will include information applicable to commercializing ideas, using technology for social applications, communicating with stakeholders, refining a pitch and more. That said, part of the finalists' boot camp preparation includes weekly correspondence with an actual NSF program officer matched to your project. The intended goal of this program is to provide customized science and engineering coaching to finalist teams. Please see the "Innovation Boot Camp" section on page 9 for more information as well as watch the Innovation Boot Camp video in the promo toolkit.

What if a team member is unable to attend the boot camp? All finalist student team members as well as the faculty mentor are required to attend the boot camp (community/industry partners are strongly encouraged to attend); however, on a case-by-case basis, NSF will consider issues that arise that may prevent team members from attending.

Are entrants allowed to accept additional monetary and/or material contributions for the development/refinement of their solution? NSF will reimburse each finalist team up to $200 to create a live presentation, including any necessary prototypes, models, visuals, displays, etc., for a display on Capitol Hill on one of the boot camp days. You are allowed to work with your mentor and community partner to develop/refine your solution, including using the resources they may bring to the effort. Details about display requirements will be made available to finalists shortly following notification of finalist status.

How will the first and second place winners be notified? Winning teams will be announced at the end of the boot camp. The first and second place teams will be mailed checks upon completion of the necessary tax forms on site, a few weeks following the boot camp, and they will also be announced in an NSF press release as well as displayed online on the challenge website.

Are team members from four-year institutions that grant associate's degrees eligible?
If the team is composed of students working towards an associate's degree only then they are

eligible. If the team is composed of students currently working towards a 4-year bachelor's degree, then they are not.