

# 1 HOW DO I START?

## I. Overview

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### A. Introduction to KID Museum & MCPS Partnership

KID Museum and MCPS are pleased to offer the third annual Invent the Future Challenge, inviting middle school students to develop, design, and prototype an innovative solution to a community problem. This districtwide STEM initiative broadens student access to hands-on, project-based learning experiences that promote creative problem-solving, adaptability, and technical skills critical to success in a fast-changing, 21st century economy. The partnership between KID Museum & MCPS focuses on providing outside-the-classroom, hands-on, experiential models of learning that engage all students in STEM, developing skills that align to the demands of college, careers, and the global workforce.

### B. About KID Museum

KID Museum aspires to create a world-class, “next generation” museum – a dynamic hub for informal learning that inspires and empowers all kids to invent the future with creativity and compassion.

We define our work around three core activities:

- 1** Deliver high-quality youth programs designed to build skills and interest in STEM, arts and culture through maker-based learning
- 2** Serve as a catalyst for change in the education system
- 3** Provide a unique community gathering place to promote intergenerational learning

In October 2014, KID Museum opened its doors at the current 7,500 square foot space, establishing a living prototype for the museum. KID Museum transformed the space into a “makerspace” for kids and families, featuring a fab lab (3D printing), a woodshop, an electronics studio, and a textiles studio. Today, the museum serves more than 55,000 people annually through school and group visits, weekend workshops, open explore activities, after-school programs, off-site programs, camps, and special events.

### C. Introduction to Invent the Future Challenge

Beginning in 2017-2018, MCPS partnered with KID Museum to pilot the Invent the Future Challenge. Approximately 500 students from 30 middle schools participated in the first year and this number grew to more than 850 students who participated in the second year. Building on these successes, the Invent the Future Challenge is launching for the 2019-2020 school year, with the goal of student participation from every MCPS middle school.

## D. What do students do through the Challenge?

Students are invited to work through an iterative invention cycle: developing an idea, designing plans, making a physical prototype, and adapting when challenges arise. Students work collaboratively and use technical skills, creative problem-solving, and STEM concepts to develop solutions to a challenge question. In teams of 3-6, students build a physical prototype that illustrates their solution to the challenge question. Any type of prototype is encouraged, from the low-tech to the high-tech, with a \$60 maximum materials budget. See the [Invent the Future Challenge Teacher website](#) for more information on guidelines around this budget. Teams present their prototypes and showcase their solutions at The Challenge Summit in May 2020, where multiple teams are recognized in a variety of categories.

## E. Challenge Question

*What will you make to protect life on this planet?*

Think of an environmental problem, big or small, that needs to be addressed. Now, think of a solution to that problem; an invention that would address that problem. Use your imagination to push beyond today's limits to invent the future.

If you accept this challenge, your team must not only dream up an invention, but also design and prototype that invention. Use engineering, coding, and design techniques to turn your ideas into something tangible. High-tech or low-tech, mechanical or digital...What will you make to protect life on this planet?

The future is up to you.

## F. Connection to the Next Generation Science Standards (NGSS)

These criteria align with a variety of Next Generation Science Standards, including but not limited to:

### Engineering Design:

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- **MS-ETS1-1.** Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
- **MS-ETS1-2.** Evaluate competing design solutions using a systematic process to determine how well they meet the criteria & constraints of the problem.
- **MS-ETS1-3.** Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
- **MS-ETS1-4.** Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

### Earth and Human Activity:

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- **MS-ESS3-3.** Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.
- **MS-ESS3-4.** Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.

Depending on the specific problem teams choose to solve, Challenge work may also cover additional standards in the following categories:

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- **MS-PS3.** Energy
- **MS-LS2.** Ecosystems
- **MS-ESS2.** Earth's Systems
- **MS-ESS3.** Earth and Human Activity

## II. Coordination

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### A. Who should be coordinating this at my school?

Someone who is committed to working with students throughout the year on design thinking and innovation. It could be:

- STEM Coordinator
- Science, Technology, Math teacher
- Media Specialist
- Counselor
- Anyone else in the building with a passion for engaging kids in design thinking and innovation

It is important to have **at least two people** per school committed to supporting the group throughout the Challenge so that the responsibilities can be shared.

### B. What is my role as the team coordinator?

At a minimum, Team Coordinator(s) is/are committing to:

- Recruiting and retaining a cohort of students
- Organizing an orientation session for parents at the beginning of the year and keeping them abreast of developments throughout the year
- Hosting a regular club/class
- Organizing transportation to the Challenge Summit in May 2020
- Organizing student turnout for the Challenge Summit
- Accompanying students to the Challenge Summit

Some MCPS schools will participate in five Invention Studio visits to KID Museum during the Invent the Future Challenge. These schools must also commit to:

- Recruiting and retaining a cohort of 30 students
- Organizing transportation to KID Museum for five Invention Studio visits and to the Challenge Summit in May 2020
- Accompanying student cohort to KID Museum for five visits and actively participating in workshops alongside students
- Administering a student survey to all participating students at the end of the year

### III. Challenge Process - How do I get started?

#### A. When do I start?

You can start working as soon as you would like! The intention is that the Challenge can be a year-long experience where students can engage in a robust iterative design process. Below are some important dates:

MONTH	DATE	EVENT
September	Wednesday, 9/18 4:30 - 6 pm	Invent the Future Challenge 101: Teacher Information Session @ KID Museum
	Friday, 9/20	Team registration opens
	Ongoing	Teachers recruiting students
	Ongoing	Parent information sessions at schools
October	Week of October 1	Invention Studio visits begin
	Wednesday, 10/16 4:00 - 5:30 pm	Invent the Future Challenge 101: Teacher Information Session Make-up Date @ KID Museum
November	Thursday, 11/14	Deadline to schedule Invention Studio visits
	Tuesday, 11/19	Virtual Learning Collaborative (1) - see website for more info
January	Wednesday, 1/15	In-Person Learning Collaborative (2) @ KID Museum
	Friday, 1/31	Team registration deadline
March	Thursday, 3/19	Virtual Learning Collaborative (3) - see website for more info
April	Friday, 4/17	Summit Registration Deadline
May	Friday, 5/1	Invention Studio visits end
	Mid May	Challenge Summit
	Within one week of the Summit	Complete teacher and student surveys

## B. Identify students to participate

Each school is encouraged to recruit students in a way that makes sense for its particular context. One of the main goals of the partnership between MCPS and KID Museum is to engage students in STEM who have traditionally been underrepresented in those fields. Students may be identified in a variety of ways:

- Student data
- Teacher recommendations
- Application process
- Specific class or club



### EXAMPLE 1: Student Data

Teachers can use student data to identify traditionally underrepresented groups in STEM. Once a list has been generated, consult with other teachers, counselors, and administrators for recommendations or concerns based on the list. Meet with the students as a group to explain the program, and send home an invitation to a parent information session. When committing to the program, parents and students should sign a participation contract.



### EXAMPLE 2: Application Process

Some schools ask students to apply to participate in the Invent the Future Challenge. On the application, students explain their interest in the program and then teachers make selections.



### EXAMPLE 3: Specific Class or Club

Some teachers have had great success working with an existing class or club. The Invent the Future Challenge can align to science classes and STEM electives which allows teachers to incorporate this program into their regular class time. Additionally, Invent the Future Challenge after-school clubs can be formed or the work can be incorporated into an existing club.

## C. Student Recruitment

Once you have identified a core group of students, you must then gauge their interest in participating in the Challenge. We recommend inviting students to an information session during lunch or after school, during which you would explain the program and give them an invitation to an evening information session for both parents and students. Follow up phone calls should be made to parents inviting them to the event and confirming their participation. For the schools with large Latino populations, ideally back to back sessions will be offered in Spanish and English.

## D. Communications to other School Personnel

Once students and families have committed to participating in the Challenge, teachers and counselors of all students involved must be informed of the Challenge and what it entails. Teachers must be informed ahead of time regarding when visits to KID Museum will occur, especially if it involves missing class time.

## E. Funding

All MCPS middle schools have access to funding through the Achievement Focused Extracurricular Programs budget, which can be used to cover:

- Transportation to KID Museum for Invention Studio workshops
- Stipends for teachers

Invention Studio (described in the next section) is open to all middle schools at a program fee. Selected schools (based on FARMS rate) received additional support to participate in the Invention Studio program. Please email [inventthefuture@kid-museum.org](mailto:inventthefuture@kid-museum.org) for more information.

Please contact your principal and financial specialist as soon as possible to discuss your school's plan for funding the Invent the Future Challenge. Please note: Invention Studio visits must be scheduled by November 14, 2019. If your principal or financial specialist has specific questions regarding MCPS funding sources, please contact Scott Murphy at [Scott\\_W\\_Murphy@mcpsmd.org](mailto:Scott_W_Murphy@mcpsmd.org).

# 2 WHAT WILL WE BE DOING?

To supplement Challenge work, schools and students have the option to participate in Invention Studio.

## I. Invention Studio Overview

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Prepare for the Challenge with a series of skill-building workshops at KID Museum. Build on what you know and learn new skills to invent your own solution to the Challenge Question. Invention Studio visits begin with a focus on developing skills in design, engineering, electronics, and coding. Throughout the sessions, KID Museum educators will guide students through focused brainstorming and designing, culminating in students building quick prototypes with tools and materials at KID Museum.

Visit 1: Introduction to Design & Engineering

Visit 2: Electricity & Coding

Visit 3: Coding & Sensors

Visit 4: Fabrication & Rapid Prototyping

Visit 5: Rapid Prototyping & Presentations

## II. Support for all Teachers

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Throughout the year, KID Museum staff is available to support teachers with any questions or concerns they have regarding the Invent the Future Challenge. We will keep in touch with team coordinators and visit schools periodically throughout the year. Please check the [Invent the Future Challenge Teacher Website](#) and email [inventthefuture@kid-museum.org](mailto:inventthefuture@kid-museum.org) with any questions.

### A. Learning Collaboratives

KID Museum will host a series of three Learning Collaboratives throughout the year, with the goal of providing teachers who are participating in the Challenge an opportunity to gather, share their experiences, ask questions, and learn from one another. Learning Collaboratives will be informal, discussion-based opportunities to connect with other individuals who are participating in the Challenge.

- Tuesday, 11/19/19 - Virtual Learning Collaborative
- Wednesday, 1/15/20 @ KID Museum
- Thursday, 3/19/20 - Virtual Learning Collaborative

### B. Materials Cost Reimbursement

While participating in the Challenge, each team may have a materials budget of up to \$60. This includes all materials used in their prototype, including electronics. Each MCPS team is eligible for reimbursement of up to \$30 of materials per participating team (out of the \$60 total budget). We have provided more guidance on budgets on the [Invent the Future Challenge Teacher website](#).

## III. Markers of Success

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Throughout the year, teams should focus their work based on the Markers of Success: IDEA, PROCESS, PRESENTATION. A rubric for these markers is located on the [Invent the Future Challenge Teacher Website](#).



### IDEA

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The Idea category celebrates a thoughtful problem choice and originality in developing an impactful solution to that problem. The project explores new ideas and approaches to protecting life on this planet, applies these ideas in innovative ways, and demonstrates the impact of the solution.



### PROCESS

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The Process category celebrates engaging in a robust, iterative, and collaborative design process. The project shows evidence of the team going through multiple stages of a design cycle, complete with incorporating feedback, learning new skills, and working together with teammates.



### PRESENTATION

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The Presentation category celebrates compelling and thoughtful communication of ideas, both through their method for presenting their work and the built prototype. The team's presentation of ideas is clear and compelling, and the prototype illustrates their solution to the Challenge Question.



## IV. Challenge Summit

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### A. Overview

The Challenge Summit is a celebration of the inspiring work students have done throughout the year. Each team will have table space to set up their prototypes and any accompanying materials such as design notebooks. During the event, teams will present their work to peers, family, friends, and the broader community. Panels of experts will circulate to each team to informally interview them and assess their work based on the Markers of Success.

The Invent the Future Challenge Summit will occur during May 2020 over a weekend day. More information on the Summit will be posted on the [Invent the Future Challenge webpage](#) as it is available.

Teams will need to RSVP to the Summit through their team coordinator by April 17th, 2020. Only teams who have officially RSVP'ed to the event will be guaranteed space to set up projects, an opportunity to present to the panels of experts, and be eligible for awards.

All are invited to attend the Summit! Fellow students, teachers, administrators, families, and friends are all encouraged to attend. As a team coordinator, it is best to arrange permission slips, transportation, and all other necessary logistics for the Summit event as soon as possible. Keep in mind that teams will also need to transport their projects and other materials to the Summit location!

### B. Student Service Learning (SSL) Hours

Students who have participated on a team throughout the year and present their project at the Challenge Summit may earn SSL hours.

Team coordinators are responsible for completing and distributing SSL forms to their team members. Each student who worked on an Invent the Future Challenge project can earn a maximum of 15 hours as follows:

- For showcasing their project at the Challenge Summit, each student can earn a maximum of 5 hours. Students who attend the Summit as an observer or a guest are not eligible for SSL hours.
- For their research, skill building and design time, each student can earn a maximum of 10 hours. This can include visits to KID Museum as well as time spent at school under team coordinator supervision.

Please feel free to make copies of the SSL form to complete for your team members. This form can be found in Section 3: Logistics and Forms.