FIRST for All: Robotics Coaching in Residential Foster and Incarcerated Facilities

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Abstract

FIRST for All (FFA) is a professional development program for robotics coach facilitators interested in mentoring teams in residential group foster homes and residential incarcerated youth facilities. Incarcerated youth do not have access to the same educational resources as the public community, including rigorous curriculum, credit recovery, GED preparation, and vocational workforce skill-building opportunities. Foster youth in residential facilities do not have access to updated computer technology or parents with STEM-related backgrounds in the home and report lower high school graduation rates (Child Welfare Information Gateway, 2021). Youth who have completed academic and vocational programs experience more favorable outcomes, internships, and employment. The First for All program consists of three distance learning modules held over Zoom and hosted by a FIRST certified trainer facilitator, graphic visual aids, a series of instructional videos, a secure online forum on the FIRST Inspires website for the community, and an added remote match series for incarcerated teams. The conclusion of the FFA training program should enable participants to complete the organization's provided Robot Inspection checklist (see Figure 1), and Field Inspection checklist (see Figure 2) independently and pass judged competition inspection successfully. Teams will also be able to complete the required engineering portfolio and learn about the importance of embodying the organization's fundamental values of "Gracious Professionalism."

FIRST for All: Robotics Coaching in Residential Foster and Incarcerated Facilities

Introduction

Robotics competitions empower youth to build robots that complete tasks to score points in tournaments with other teams. The First Tech Challenge (FTC) competition was designed by US FIRST in supplement to their existing FIRST Robotics Competition (FRC) as a more budget-conscious beginner level high school program option (Center for Youth and Communities Heller School for Social Policy and Management Brandeis University Waltham, MA, 2011). FIRST for All (FFA) is a professional development program for robotics coach facilitators interested in mentoring teams in residential group foster homes and residential incarcerated youth facilities. The program aims to provide the necessary mentorship, supplies, and ongoing support for robotics coach facilitators to grow and sustain FTC teams and compete in person or remote matches. The program's goal is to improve educational outcomes, workforce opportunity skills and spark interest in STEM-related learning for underrepresented youth.

The First for All program consists of three distance learning modules held over Zoom and hosted by a FIRST certified trainer facilitator, graphic visual aids, a series of instructional videos, a secure online forum on the FIRST Inspires website for the community, and an added remote match series for incarcerated teams. Teams meet at their group locations. A coordinator will be available to conduct in-person training on a case-by-case basis on-site through an existing professional development network. Corporate sponsors will be matched by the FIRST organization for qualifying FFA teams. The Robot Inspection Checklist, Field Inspection Checklist, and Engineering Portfolio, which are requirements of the existing FIRST Tech Challenge, will serve as the tool for the program's final evaluation. The terminal program objective is:

- Given an online hub with additional audience-specific resources, the First Inspires website, and distance learning focus groups, participants will be able to plan, design, and build a First Tech Challenge compliant robot for competition.

Deliverables

The student participant and robotics coach facilitator teams will be provided with:

- A unique website known as the "online hub" that includes links to the science and technology survey, code of conduct, supply kit ordering, graphic aids, a series of instructional videos, Zoom FFA facilitator lead recordings, inspection checklists for evaluation, a secure online forum for the community, and an added remote match series scoreboard for residential facilities
- dashboard on the existing FIRST Inspires website for the robotics coach facilitator to log in student team members and manage donations and purchases from sponsorships
- FIRST Inspires website that includes existing gameplay materials, including robot building and programming resources and rules

FFA facilitators will be provided with:

- Google Slides for distance learning modules lead over Zoom
- log in credentials to the online hub for one-to-one support and mentor assignment

Needs Assessment and Root Cause

Determining the need for a training engagement is essential to the process (Hodell, 2016). Why is FFA needed now? Incarcerated youth do not have access to the same educational resources as the public community, including rigorous curriculum, credit recovery, GED preparation, and vocational

workforce skill-building opportunities. Despite the U.S. Departments of Education and Justice guiding educational principles, only eight states report offering programs with educational equity (Locked Out: Improving Educational and Vocational Outcomes for Incarcerated Youth, 2015). Foster youth in residential facilities do not have access to updated computer technology or parents with STEM-related backgrounds in the home and report lower high school graduation rates (Child Welfare Information Gateway, 2021). Youth who have completed academic and vocational programs while incarcerated experienced a lower recidivism rate and more significant employment following release (Foley, 2001). Foster youth STEM programs, such as Pivotal, offer a social community and sense of connection for students by providing Saturday STEM clubs, laptops, and Silicon Valley mentors, resulting in positive outcomes, internships, and employment (*Pivotal*, 2021).

In a recent study by the Center for Youth and Communities Heller School for Social Policy and Management Brandeis University Waltham, MA (2011), participants and team leaders in FTC reported gains in critical outcomes, including a better understanding of the use of science and technology in the real world; increased interest in STEM and STEM-related careers; increased interest in school success and college readiness; and gains in several workplace skills among them critical thinking, problem-solving, communications and teamwork. The same study also found that weaknesses of the FTC competition included funding, curriculum, and technical assistance resources. Among those surveyed, 75% reported that it would make it easier for new teams to become part of FIRST by lowering costs and helping teams find sponsors. Participants indicated the need for more instructions, manuals, and workshops, plus help with fundraising and recruiting mentors as priorities for team support.

The current state is that participation is low to non-existent for residential group foster homes and incarcerated youth facilities and would seem unlikely to grow or flourish given the above-referenced challenges in the survey of sponsorship, training, and mentors. FIRST for all bridges the gap

and fills the educational need to create and provide these resources using FTC, a lower-cost and more accessible robotics competition, and additional resources to meet program goals.

Educational Program Goals

As Tyler (2013) shares, “Education is a process of changing the behavior patterns of people” (5). The program's overall goal is to provide opportunities for underserved populations to improve educational outcomes, workforce opportunity skills and stimulate interest in STEM careers. Coordinating a robotics team and competition can be intimidating. The goals of the training materials include mastering the basics of the FTC competition, including onboarding the team to the gameplay rules, robot building guidelines, and engagement with meets and qualifying matches. Additional educational program goals of FFA incorporate training for Coach Facilitators working with a high need population, visual scaffolding supports to close the gap for English language learners and special education students, access to corporate sponsorships for equipment, supplies, transportation, and mentorship engaging in meets and qualifying tournaments.

There are three desired states as outcomes for our program, which provides critically needed equal access to educational services. The first desired state is increased confident participation of residential foster and incarcerated youth in FTC qualifying tournaments with designed robots equivalent in look and feel and performance to currently enrolled teams during in-person or remote matches. The second desired state is a raise in math and reading benchmarks, increased high school graduation and GED rates, and data that reveals an increase in pursuing STEM careers for students who participate in our program. A third desired state is a positive survey result from Coach Facilitators that the additional program materials met or exceeded their needs while mentoring a robotics team.

Population Profile

Our population consists of the Coach Facilitators and the students benefitting from the FFA experience. The student target population for FFA is high school-aged students from 9th to 12th grade in residential group foster homes and incarcerated youth facilities. There is approximately 36,000 incarcerated youth in U.S. residential facilities (Locked Out: Improving Educational and Vocational Outcomes for Incarcerated Youth, 2015), and an estimated 4,000 youth living in residential group foster homes in the state of California alone out of a U.S. population of 423,000 (Child Welfare Information Gateway, 2021). The population is disproportionately male, African American, Hispanic, and Native American, but FFA will also target Caucasian, Asian and female students. Our population may need special education support; they may be English language learners with math and reading skills below grade level which may be at risk of not graduating from high school or identified as previously dropping out of school (Locked Out: Improving Educational and Vocational Outcomes for Incarcerated Youth, 2015).

Coach facilitators will be community volunteers, career technical educators, teachers, and STEM professionals passionate about introducing science and technology topics to at-risk youth (Center for Youth and Communities Heller School for Social Policy and Management Brandeis University Waltham, MA, 2011). It is assumed that some coach facilitators will have technical knowledge, but many may not. The program will pair technical mentors with coach facilitators who request support and provide for collaboration using the online community. The robotics coach facilitators and student participants are known collectively as a "team."

FFA facilitators will be certified trainers who have previously participated in a FIRST Tech Challenge competition and have experience with existing professional development programs in the FIRST organization. This is a compensated position.

The club is voluntary, and students will indicate an interest in Science and Technology topics by a survey. No prior experience with robotics is required. The program's motivation to engage should be stimulated using the existing FIRST Inspires website and the newly created online community for residential youth programs. Coach Facilitators should adopt an andragogical approach where students collaborate in a non-authoritative climate (Knowles et al., 2020). Behavioral issues working with the population may be expected and therefore preparing the learner and then setting mutually agreed upon objectives is essential to team management (Tyler, 2013). The Coach Facilitator is a change agent, sometimes working with tools and equipment that involve safety concerns; therefore, the learner must be self-directed and enjoy inquiry-based problem-solving tasks. Robotics provides an opportunity for students to engage the three domains of Bloom's Taxonomy: cognitive, affective, and psychomotor. Students engage in the cognitive domain by learning the information and knowledge needed to assemble and program the robot, students engage in the affective domain by learning the rules of gameplay and the value of teamwork in competition, and they engage with the psychomotor domain as they build and iterate the robot design (Knowles et al., 2020).

Participants are expected to support technology and distance learning to engage with FFA enthusiastically. Some of the population will be incarcerated and unable to have full access to materials otherwise. Additionally, students and Coach Facilitators begin by completing a survey indicating an interest in Science and Technology.

Prerequisites

Student participants in the FFA program will qualify if they: a) are a high school-aged student in a residential group foster or incarcerated youth facility, b) positively complete an online survey indicating an interest in science and technology topics, c) agree to follow a code of conduct to maintain access to the tools and supplies. Robotics coach facilitators in the FFA program will qualify if they: a) are

at least 21 years old with interest in volunteering with at-risk youth and technology, b) speak and write English at the High School level, c) pass a background check that authorizes the ability to work with students, d) have a laptop computer and an internet connection available.

FFA facilitators will qualify if they: a) are at least 21 years old with interest in working with at-risk youth and technology, c) have at least one season of experience with the FIRST Tech Challenge competition, d) are a FIRST Certified Trainer**,** f) pass a background check that authorizes the ability to work with students g) foster Gracious Professionalism® and FIRST Core Values in students.

Additional Considerations

Students will be encouraged to embody FIRST Robotics' concept of "Gracious Professionalism," defined on the FIRST website as "a way of doing things that encourages high-quality work, emphasizes the value of others, and respects individuals and the community" (*First Robotics Competition*, 2021). Students are encouraged to build social networks with other teams to improve their designs, update their code and engage in science and technology topics. While some students in this population may struggle with these concepts and ultimately decide that the program is not a fit, others will build these skills by joining the club and accessing the additional resources of FFA. Youth enjoy trying different clubs and groups and may change their interests. Small but nimble teams are expected and encouraged. Groups may have multiple teams participate and compete for residential facilities with great interest.

Curriculum and Instructional Design

FFA is a technology-facilitated experience that will involve computer-based training, distance learning, and multimedia (Hodell, 2016). Students' expected location is their residential facilities, with their robotics coach facilitators managing the website hub and distance learning technology. FFA facilitators will be offsite and deliver content using a Google Slide deck and Zoom. The content will be organized effectively according to continuity, sequence, and integration so that team knowledge may

grow incrementally using social learning constructs (Tyler, 2013). The three modules are a) Kick-off, b) Building Resources, and c) Qualifying Competition Preparation.

Module 1 – Kick-Off

Module 1 enables the FFA facilitator to "begin where the student is" (Tyler, 2013, p. 66) by taking the teams through the basics of the FFA online hub and "Game & Season" links and resources on the firstinspires.org website. Leveraging Gagne's top four Nine Events of Instruction, according to Hodell (2016), teams will be able to achieve the following objectives:

- Given access to the online hub and guidance from the FFA Facilitator, students should be able to complete the technology survey Code of Conduct agreement and validate interest in STEM.
- Given access to the FIRST inspires website, the robotics coach should be able to register adult and youth members on the FIRST Dashboard.
- Given access to the FIRST inspires website and guidance from FFA Facilitator, students and robotics coaches should locate robot building and programming resources on the "Game & Season" tab.
    - Students should be able to locate the definition of "Gracious Professionalism."
- Given access to the online hub and guidance from the FFA Facilitator robotics coach, students should locate instructional videos and graphic aids, order robot kit supplies, and organize the team according to mechanical building or programming preferences.

The FFA facilitator will be provided with Google Slides to lead the discussion over Zoom and do a screen share of the location of resources. Introduction warm-up activities will be provided to promote team building and community. Teams self-organize by mechanical or programming tasks and determine their objectives and goals (Knowles et al., 2020).

Results are measured according to Kirkpatrick's Model of Evaluation Level 1, calculating the degree to which participants found the training valuable and relevant to their work (Kirkpatrick & Kirkpatrick, 2016). Students and robotics coaches will be provided with an exit survey using Google Forms to indicate their reaction and understanding of the material to be completed across all channels. FFA Facilitator will also have brief exit interviews with participants on Zoom to gauge learners' reactions to the overall material and answer questions for quality control (Hodell, 2016)

Module 2 – Building Resources

Given that the same learning experience will bring about a range of outcomes, Module 2 aims to support teams in understanding robot building resources (Tyler, 2013). The FFA facilitator is essential to ensuring that each learner meets mastery and can complete a robot. The FFA facilitator also monitors the organizing of technical mentors and professional development coordinators based on gaps in understanding, using Gagne's application-feedback paradigms (Hodell, 2016). The team will be able to achieve the following objectives:

- Participants will work with and implement Basic Bot Guides and Programming Resources given access to the FIRST inspires website and guidance from the FFA Facilitator.
- Given access to the online hub and guidance from the FFA Facilitator, participants should be able to work with hardware video tutorials, enroll and set appointments with mentors and coordinators, and locate the engineering portfolio template and graphic aids.
- Given access to the online hub and guidance from the FFA Facilitator, robotics coaches should register for scrimmage meets.
- Given guidance from FFA Facilitator and access to digital research tools, students will conduct independent robot research using Google and YouTube.

The FFA facilitator will be provided with Google Slides to lead the discussion over Zoom and share the resources, answering questions and conducting Kirkpatrick Level 1 assessments of materials based on reactions and discussions. Gains are computed using Kirkpatrick's Level 2 evaluation, which measures the degree to which participants acquire knowledge based on their participation (Kirkpatrick & Kirkpatrick, 2016). Knowledge checks will be dynamically located inside the online hub relative to the features that enable the above-referenced objectives. Knowledge check results will generate feedback for teams from coordinators and mentors using Gagne's model of feedback and application (Hodell, 2016). Additionally, the FFA facilitator will complete a survey from the facilitator's perspective and evaluate the effectiveness of the materials and technology and provide evidence of the knowledge teams are securing (Hodell, 2016; Tyler, 2013).

Module 3 – Qualifying Competition Preparation

Module three prepares teams for competition utilizing Gagne's final three events of instruction with feedback to complete an engineering portfolio, competition entry, evaluation using the inspection checklists, and closure that includes team reflection and feedback for the FIRST inspires organization (Hodell, 2016). Teams will be able to achieve the following objectives:

- Given access to the online hub and guidance from the FFA Facilitator, students will be able to submit the first draft of the Engineering Portfolio for review and feedback by mentors.
- Given access to the FIRST inspires website, and guidance from the FFA Facilitator, robotics coaches, should be able to register for the Qualifying Tournament competition, locate Robot and Field Inspection Checklists and review the definition of "Gracious Professionalism."

- Given a focus group discussion with FFA Facilitator, participants will explain robot build and programming pain points by demonstrating their process and planning, identifying bug resolution options, and preparing for the interview process at the Qualifying Tournament.

The FFA facilitator will be provided with Google Slides to lead the discussion over Zoom and do a screen share of the location of these resources. The FFA facilitator will evaluate this phase of the program using Kirkpatrick's Level 3 evaluation based on how participants can apply what they learned during the training. FFA facilitators will record feedback in the online hub using quantitative and qualitative data collection and identify trends for follow-up sampling questions with select participants post-program (Kirkpatrick & Kirkpatrick, 2016). Participants should be able to demonstrate behavior that implies confidence about the possibility of a working robot and the ability to complete the terminal objectives of the course, which includes the checklists and engineering portfolio, during the focus group discussion. Closure focuses on Qualifying tournament preparation, opportunities to apply the team's new skills, and appreciation of the progress made (Hodell, 2016).

Delivery Model and Planned Instructional Strategies

The length of the program follows the calendar for the FIRST Tech Challenge, which begins mid-September with scrimmage meets as early as October and qualifying matches held from February through March. Module 1 should take place in September, Module 2 in October, and Module 3 in January. The program follows Gagne's Nine Events of Instruction lesson design, which supports learners' ability to retain concepts and skills if presented with hands-on experience and feedback that supports memory functions. Modification for English language learners and reading abilities is available using graphic aids, including sentence starters, essential vocabulary, and visual guides. Students are also encouraged to use closed caption tools and peer collaboration. One-to-one teacher support and feedback are crucial.

Materials and Resources

Students should have access to tablets or Chromebooks to follow technology-enhanced materials. One personal computing laptop with Windows operating system is required for the programmer to integrate with Rev Robotic controller. Additional materials and resources include those previously referenced, such as the FIRST website (https://www.firstinspires.org/robotics/ftc/game-and-season), ZOOM log-in credentials, YouTube with closed captioning, Immersive Reader, online hub website for the community, graphic aids, and Robot and Field Inspection Checklists.

Program Evaluation Plan

Formative Evaluation

The formative evaluation will examine the terminal objective and assess what was accomplished analogously to Kirkpatrick's level 4 evaluation (Hodell, 2016). According to the program objective, participants should plan, design, and build a First Tech Challenge compliant robot for competition. Level 4 evaluation measures the "degree to which targeted program outcomes occur and contribute to the organization's highest-level result" (Kirkpatrick & Kirkpatrick, 2016, p. 39). Passing robot and field inspection, which includes the First Tech Challenge judge approving mechanical specifications and computer programming validation, is complex and intimidating (Center for Youth and Communities Heller School for Social Policy and Management Brandeis University Waltham, MA, 2011). The conclusion of the FFA training program should enable participants to complete the organization's provided Robot Inspection checklist (see Figure 1), and Field Inspection checklist (see Figure 2) independently and pass judged competition inspection successfully.

Students should also complete an engineering portfolio that documents designing and building the robot and allows the team to submit themselves for FTC award consideration. This process involves

completing the provided template in module 2 with review and feedback from the coach, coordinator, mentors, and FFA Facilitator using online tools and small focus groups for feedback and revisions. The engineering portfolio is creatively subjective. Therefore, the formative evaluation focuses on completing all 15 pages and submitting them to the dashboard portal with the highest quality based on accommodations.

One final focus group using Kirkpatrick's Level 1 assessment will be conducted post-competition to measure participants' reactions to the overall experience of FIRST For All program resources and program.

Conclusion

The goal of the First for All training program is to advance gains in critical outcomes, including a better understanding of the use of science and technology in the real world; increased interest in STEM and STEM-related careers; increased interest in school success and college readiness; and gains in several workplace skills among them critical thinking, problem-solving, communications and teamwork. Bridging the gap between the thrill of competitive robotics and the weaknesses of the FTC competition, including funding, curriculum, and technical assistance resources, is the FFA program's hope. Cultivating the values of "Gracious Professionalism" in residential group foster homes and residential incarcerated youth encourages high-quality work, emphasizes the value of others, and inspires respect for individuals and the community.

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Figure 1

Robot Inspection Checklist

Robot Inspection Checklist

Team Number: _____ Robot Inspection Status (circle): **PASS** / **FAIL**

Team	Insp.	Robot Size Inspection	Rule #
		Robot is presented at inspection with all mechanisms (including all components of each mechanism), configurations, and decorations that will be used on the Robot during the competition.	<I06>
		Separately test the Robot in all of its unique starting (pre-match setup) configurations. The Robot fits within the Sizing Tool without exerting undue force on the Sizing Tool sides and	<I06>a <RG02>
		Robot Motion Warning Label is attached if servo motors move during the Robot initialization.	<RG02>
✔	✔	**General Robot Rules**	**Rule #**
		Robot does not contain any components that could damage the Playing Field or other Robots.	<RG01>a&b
		Robot does not contain materials that are hazardous.	<RG01>c
		Robot poses no obvious unnecessary risk of entanglement.	<RG01>d
		Robot does not contain sharp edges or corners.	<RG01>e
		Robot does not contain animal-based, liquid, or gel materials.	<RG01>f&g
		Robot does not contain materials that would cause a delay of game if released.	<RG01>h
		Robot does not contain elements that electrically ground the Robot frame to the Playing Field.	<RG01>i
		Robot does not contain closed gas devices.	<RG01>j
		Robot does not contain hydraulic devices.	<RG01>k
		Robot does not contain vacuum based mechanisms.	<RG01>l
		Team number is visible from at least 2 sides and meets requirements.	<RG04>
		Alliance Markers are present and meet requirements.	<RG05>
		Energy used by the Robot, (i.e., stored at the start of a Match), shall come only from approved sources.	<RG06>
		Robot is not capable of launching its own components.	<RG07>
✔	✔	**Robot Mechanical Parts and Materials Rules**	**Rule #**
		All components on the Robot are from allowable raw materials and Commercial Off The Shelf products.	<RM01> <RM02> <RM06>
✔	✔	**Robot Electrical Parts and Materials Rules**	**Rule #**
		The Main Power Switch is installed properly, labeled, readily accessible, and visible to competition personnel. The TETRIX, REV, and MATRIX switches are the only allowed Main Power Switch.	<RE01>
		All batteries are securely attached to the Robot in a location where they will not make direct contact with other Robots or the Playing Field.	<RE02>
		Exactly one (1) Robot Main Battery Pack of an approved type is on the Robot and it is properly connected to the Main Power Switch and either the REV Expansion Hub or REV Control Hub.	<RE03> <RE05>a(i&ii)
		Where present, fuses must not be replaced with fuses of higher rating than originally installed or according to manufacturer's specifications. Fuses are single use only.	<RE04>
		Allowed electronic devices are powered by power ports on the REV Expansion Hub or REV Control Hub except as noted in <RE05>a&b, <RE13>, and <RE14>.	<RE05>a
		The REV Expansion Hub and/or REV Control Hub is powered by the Robot main battery.	<RE05>a(i&ii)
		REV SPARK Mini Motor Controllers and REV Servo Power Modules are powered by the Robot main battery or a REV Control or Expansion Hub XT30 port.	<RE05>a(ii)
		Allowed sensors may only receive power from the REV Expansion Hub or REV Control Hub.	<RE05>a(iii)

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FIRST Robotics Competition. (2021). FIRST Tech Challenge.

(https://www.firstinspires.org/sites/default/files/uploads/resource_library/ftc/field-inspection-checklist.pdf). In the public domain.

Figure 2

Field Inspection Checklist

Field Inspection Checklist

Team Number: _____ Field Inspection Status (circle): **PASS** / **FAIL**

✔		Drive Team Members Present	Rule #
		Coach (required), Driver 1 (required); Driver 2 (optional)	<C06>
✔		**Driver Station and Robot Controller Hardware Rules**	**Rule #**
		Driver Station consists only of one Android device (Circle): Motorola Moto G 2nd Generation, Motorola Moto G 3rd Generation, Motorola Moto G4 Play, Motorola Moto G5, Motorola G5 Plus, Motorola Moto E4, Motorola Moto E5, Motorola Moto E5 Play, or REV Driver Hub.	<RE07> <DS01>
		Smartphone Robot Controller Android device (if used) is one of the following models (Circle): Motorola Moto G 2nd Generation, Motorola Moto G 3rd Generation, Motorola Moto G4 Play, Motorola Moto G5, Motorola G5 Plus, Motorola Moto E4, Motorola Moto E5, Motorola Moto E5 Play. The Android device's USB interface only connects to a REV Expansion Hub or a USB hub.	<RE07>
		The touch display screen of the Driver Station must be accessible and visible to field personnel.	<DS02>
		The Driver Station consists of no more than two of the allowed gamepads (Logitech F310, Xbox 360, wired Sony DualShock 4 for PS4, or Etpark Wired Controller for PS4) in any combination.	<DS03>
		No more than one (1) optional external battery powered or unpowered USB hub is allowed.	<DS04>
		No more than one (1) optional COTS USB external battery connected to the REV Driver Hub USB-C port or a USB hub connected to the smartphone Android Device is allowed.	<DS05>
		Driver Station smartphone Android device (if used) USB interface is only connected to either a Mini USB to OTG cable or combination of cables connected to one USB Hub, or one gamepad USB cable connected to an OTG Micro Adapter.	<DS06>
		Driver Station Carrier (if present) meets requirements.	<DS07>
DS	**RC**	**Driver Station (DS) and Robot Controller (RC) Software Rules**	**Rule #**
		Android smartphone(s), REV Driver Hub, and REV Control Hub are named with the official team number followed by –DS or –RC as appropriate.	<RS01>
		Android operating system satisfies the requirements: Motorola Moto G 2nd Generation, Motorola Moto G 3rd Generation, Motorola Moto G4 Play – version 6.0 or higher. All other allowed Android devices –version 7.0 or higher.	<RS03>
		DS and RC apps are version 7.0 or higher and the DS and RC apps have the same version	<RS03>
	NA	REV Driver Hub (if used) operating system is version 1.1.0 or higher.	<RS03>
	NA	REV Driver Hub (if used) has Bluetooth turned off and Wi-Fi turned on.	<RS07>
NA		REV Control Hub (if used) operating system is version 1.1.2 or higher.	<RS03>
NA		REV Expansion Hub (if used) firmware version is 1.8.2 or higher.	<RS03>
NA		REV Control Hub (if used) has Wi-Fi turned on, Bluetooth is turned off, and the password is different than the factory default value of "password".	<RS07>
		Android smartphones (if used) are set to airplane mode, Wi-Fi is turned on, and Bluetooth is turned off.	<RS07>
		Android devices are not connected to any local networks.	<RS09>
		All remembered Wi-Fi Direct Groups and Wi-Fi connections on Android devices have been removed.	

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FIRST Robotics Competition. (2021). FIRST Tech Challenge.

(https://www.firstinspires.org/sites/default/files/uploads/resource_library/ftc/robot-inspection-checklist.pdf). In the public domain.