# The Next Generation of Innovators

## Medtronic Spark Explore Post Curriculum Teacher Guide

This module acts as the bridge between the physical "in lab" activity and the student's future, deconstructing the myth that innovation and careers in health technology are reserved for a select few. Through the **Innovator Anatomy** framework, students reflect on their specific contributions during the lab—whether they were the ones using the data to troubleshoot a technical "glitch," testing potential solutions, or communicating the final prototype. By mapping these actions to real-world roles like Biomedical Engineers or Clinical Specialists, students begin to see themselves as part of the STEM ecosystem.

By the end of the session, students will have moved from being passive observers of technology to active "Innovators In Training," equipped with a clearer understanding of how their unique strengths could one day help save lives in a health technology field.

## TIMING

Ideally, this activity should occur within a few days to one week of the mobile experience to ensure that students can recall the experience, specific challenges overcome, and actions that were taken.

## LEARNING OUTCOMES

**Students will know:**

- Medical devices such as pacemakers are developed through a multi-stage collaborative engineering process.
- Real-world STEM careers are interconnected roles within a system, not isolated jobs.
- Innovation in medical technology requires a balance of technical performance, safety, and patient impact.
- Engineers use a combination of mindsets and skills (e.g., curiosity, persistence, collaboration) to solve complex problems.

**Students will understand:**

- STEM innovation is a collaborative system, where different specialists contribute unique expertise toward a shared outcome.
- The work they completed in the mobile lab reflects authentic professional engineering practices, not simplified classroom tasks.

- Success in engineering is not defined by a single correct answer, but by iteration, tradeoffs, and continuous improvement.
- Personal traits such as curiosity, flexibility, creativity, risk-taking, persistence, collaboration, and empathy are essential to real-world innovation.
- They already demonstrate behaviors that align with real STEM career pathways.

**Students will be able to:**

- Identify and describe key roles in a medical device development team.
- Connect specific lab activities (e.g., testing, designing, analyzing, assembling) to real-world engineering responsibilities.
- Classify their own behaviors using innovation traits (curiosity, flexibility, creativity, risk-taking, persistence, collaboration, empathy).
- Explain how different engineering roles contribute to a shared system outcome.
- Justify a match between their lab experience and a potential STEM career pathway using evidence from their actions.
- Articulate a personal statement of identity as an innovator.

## MATERIALS PREPARATIONS

**Materials are per group of 4-6 students.**

**Print and cut out Innovator Anatomy Cards.** These represent innovator behaviors. There should be one of each of the following:

- Eyes
- Brain
- Heart
- Hands
- Ears
- Gut

**Print and cut out Innovator Career Cards.** These represent careers explored in the mobile unit. There should be one of each of the following:

- Biomedical Engineer
- Software Developer

- Test Engineer
- Data Scientist
- Manufacturing Engineer
- Surgical Systems Engineer
- Quality Assurance Engineer
- Clinical Specialist
- Regulatory Affairs Specialist
- Systems Engineer

## STUDENT GROUP SET-UP

**It is recommended to create student groups so that different stations from the mobile lab experience are represented in each group.**

- 6 Innovator Anatomy Cards
- 10 Innovator Career Cards
- 6 colored markers/pencils (unique color for each student in group)

## TEACHER PACING NOTE

This lesson is designed to flex based on class time. Teachers should choose one of the following pathways:

### Standard 45-Minute Implementation

Pacing times for each section are marked in the lesson plan with the shorter time recommendation.

- Complete the Do Now, Parts 1-4, and Survey
- Assign the Career Spotlight Investigation as optional homework if desired.

### Extended Class Time or Two-Day Implementation

Use this if you want more student conversation and reflection time. Pacing times for each section are marked in the lesson plan with the longer time recommendation.

- **Day 1:** Complete the Do Now and Part 1
  *Note: Collect or have students store their Innovator Profiles for Day 2*

- **Day 2:** Resume with a quick reconnect then Parts 2-4 and Survey
- **If time allows on Day 2:** Complete the Career Spotlight Investigation during class, otherwise it can be assigned as optional homework if desired.

## LESSON PLAN

### Do Now (5-15 minutes)

- As students enter, have students complete the top section of the Innovator Profile.
    - Remember back to your experience on the Medtronic Spark Explore mobile lab. What was the most exciting moment or successful "fix" you completed?
- Direct students turn and talk or have a few students share out their responses.
- Ask the class: What was a moment where you felt frustrated or stuck?
    - Discuss in pairs or have a few students share out to the class.
- Explain that every Medtronic innovator starts with those same two feelings: excitement and frustration. The difference is that innovators use frustration as a "data point" to try a new solution. Both are important in propelling forward toward a solution.
- Before transitioning to the main activity, break the class into groups of four to six students. Ideally each group would have a "representative" from each station from the mobile lab experience (Data Analysis, Design, Testing, Software, Manufacturing, and Robotics). Have students push desks together to create a shared workspace, if necessary.

### PART 1: What Did You Do? (10-25 minutes)

- Describe to students that there are different traits that make up a strong innovator. Explain how these traits combine to create a full innovator anatomy.
- Direct students to lay all anatomy cards out on their table
- Ask students to read the cards aloud one at a time as a group.
    - Clarify meaning as you go through to ensure each student understands the trait being described.
    - Eyes = Curiosity
        - I notice, question, and wonder
        - Asking why something happens, exploring different possibilities, paying attention to patterns in data or outcomes
    - Brain = Flexibility and Problem Solving
        - I adjust my thinking when things change

        - Changing strategy when something fails, reworking a plan based on results, shifting approach between trials
    - Heart = Empathy
        - I think about people and impact
        - Considering patient safety, thinking about real-world consequences, designing for human needs
    - Hands = Persistence
        - I keep trying and improving through action
        - Repeating tests, fixing errors, building and rebuilding
    - Ears = Collaboration
        - I share, explain, and work with others
        - Talking through ideas, explaining reasoning, coordinating team decisions
    - Gut = Risk-Taking
        - I try ideas even when I'm not sure
        - Testing uncertain solutions, making bold design choices, trying new approaches without guarantees
- Direct students to choose the two parts of their innovator they used MOST during the lab experience. Direct them to mark these with a check mark on their Innovator Profile.
    - Remind students that innovators use all these traits at different times. They are identifying the traits they relied on most during this experience, not the only traits they have.
- Direct students to write an example of what they did on the shared cards in their unique color.
- Encourage overlapping use of the anatomy cards. Multiple students may mark the same card.
    - Explain that this is expected and there is value in this crossover.
    - Point out that many different careers in health technology rely on the same skills, even when the work itself looks very different.
- Direct students to discuss what they wrote on the cards that have the most overlap.
    - How were the same innovator "parts" used even in very different contexts?
- Conclude by reinforcing that innovation roles are flexible and collaborative. Engineers, software developers, surgeons, manufacturing specialists, and data analysts may all use communication, persistence, empathy, creativity, and problem-solving throughout their work.

**PART 2: Find the Career Match (10-15 minutes)**

- Distribute or have students pull out the Innovator Career Cards.
- Task students with finding the career that best matches the kind of work they did on the mobile lab.
    - They should compare the types of tasks/actions this professional does to find alignment with the actions described on the anatomy cards.
- Direct students to select the best 1-2 career matches.
- Direct students to discuss in their group how they think their experience matched the career.
- Direct students to write their top career connection on their Innovator Profile and to describe why that career fit best.

**PART 3: Innovation Team Insight (5-10 minutes)**

- As a class, discuss how all these careers were necessary in getting the product safely made.
    - Remind students that these careers represent only a small sample of the many roles involved in health technology. Emphasize that health tech teams include people with many different strengths, interests, and ways of thinking.
- Using their Innovator Profile, direct students to capture one different role that interests them and why.
    - Encourage students to look beyond only the role that matched the station they completed. A student may enjoy or connect with a different career because of the skills it uses, the problems it solves, or the way team members work together.
    - Guide students to notice that different careers may share similar skills. For example, persistence, communication, creativity, or problem-solving may appear across many different roles.

**PART 4: Final Identity Moment (5 minutes)**

- Have students reflect and complete the following sentence on their Innovator Profile as their exit ticket.
    - I was acting like a {career} when I used my innovator {anatomy part} by {action they did on the lab}.
- Have students do a quick turn and talk or have 2-3 volunteers share their sentence.

**PART 5: Survey (10 minutes)**

- Wrap up the discussion and prepare students to complete the post experience survey. To keep this more fun, the following script can be used.
    - Everything you just said—that's exactly what real innovators do. They reflect on how they think, what they're good at, and where they want to grow.
    - The next step is to capture that thinking while it's fresh. Not just what you did—but how you worked and what that might mean for your future.
    - Use the QR code / device to complete your Innovator Snapshot.
        - Answer based on what you experienced on the mobile lab and in class today—not what you think the 'right answer' is.
    - This helps us understand how students like you think and solve problems—and helps us make experiences like this even better.
- After survey reinforce that the Innovator Profile is theirs to keep. Explain:
    - This is yours. This shows how you think as an innovator—something not everyone has figured out yet.

**Optional Extension: Career Spotlight Investigation (15-30 minutes)**

- Direct students to select one career that interests them from the Career Match activity.
- Students watch the corresponding Career Spotlight video and record responses to the following prompts:
    - What does this professional do as part of their job?
    - What innovator anatomy traits seem most important in this role?
    - What surprised you about this career?
    - What is one question you still have about this profession?
- If completing during class time, after viewing have students share with a partner or small group:
    - Which career they explored
    - One new thing they learned
    - Whether the career became more or less interesting after learning more about it

## ALIGNMENT TO STANDARDS

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| **MS-ETS1-1** | **Define the criteria and constraints of a design problem with sufficient precision** | Students reflect on how the pacemaker design addressed the specific constraints of the human heart. |
| **HS-ETS1-2** | **Design a solution to a complex real-world problem by breaking it down into smaller, manageable sub-problems** | Students map the "relay race" of innovation, showing how specialized roles solve sub-tasks to reach a final goal. |
| **SEP 8** | **Obtaining, Evaluating, and Communicating Information** | Students evaluate career data and communicate their own "Innovator Identity" through a reflective profile. |
| **CCC 4** | **Systems and System Models** | Understanding the Medtronic ecosystem as a system where diverse roles interact to ensure device safety and efficacy. |

**MS - Middle School; HS - High SchoolETS - Engineering;**
**SEP - Science & Engineering Practices; CCC - Crosscutting Concepts**