# The STEM²D
# Student Activities
# Series Overview

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# THE STEM²D STUDENT ACTIVITIES SERIES OVERVIEW

## What is WISTEM²D?

In 2015, Johnson & Johnson launched WiSTEM²D or Women in Science, Technology, Engineering, Mathematics, Manufacturing, and Design (STEM²D).

Led by a network of volunteers from across Johnson & Johnson and its local operating companies, this ambitious initiative involves:

- **Youth Programs: (ages 5-18)** Sparking enchantment with STEM²D subjects in young women and girls through creative problem solving and play.

- **University Programs:** Inspiring career paths, by partnering with select academic institutions to develop high-impact strategies for recruiting, retaining, and engaging women leaders.

- **Professional Programs:** Tapping into the power of diversity through reimagined recruitment and retention of the world's best technical female talent.

The goal is to engage females at all ages and throughout every cycle of their educational and professional lives in STEM²D fields.

Johnson & Johnson aims to cultivate females' STEM²D interests at an early age and help them continue to grow and develop in these areas, preparing and positioning them to pursue higher education and careers in STEM²D. With this foundation, they are primed to make valuable contributions to their communities, companies, and the world in the decades ahead.

To advance youth outreach, Johnson & Johnson partnered with leading nonprofit organizations FHI 360, JA (Junior Achievement) Worldwide, and the Smithsonian Science Education Center. As part of this effort, FHI 360 and JA developed **STEM²D Student Activities**, a series of interactive activities with step-by-step instructions and student handouts that enable employees and community leaders to confidently offer hands-on, minds-on experiences for girls and young women, age 12–18, around the world.

# WHAT IS THE STEM²D STUDENT ACTIVITIES SERIES?

The STEM²D Student Activities series includes more than 10 interactive and fun, hands-on activities for girls and young women, ages 12–18, globally. All activities are aligned with research-based theory and the STEM²D philosophy.

Each activity targets one or more of the STEM²Dsubjects:

**Science:** Observing, studying, and experimenting in an effort to better understand the natural world and how it works.

**Technology:** Putting science and other knowledge to practical use to solve problems, invent useful tools, envision new possibilities, and establish meaningful connections between people and the world that surrounds them.

**Engineering:** Applying science and math principles to design and develop products, structures, machines, tools, or systems that improve everyday life.

**Mathematics:** Using a quantitative framework (numbers, quantities, shapes, abstract principles, and problem solving) to describe the world.

**Manufacturing:** Creating something from raw materials by hand or by machinery.

**Design:** Creating, constructing, or inventing an object, plan, product, or system; it is also a human-centered mindset and collaborative approach that results in better experiences by uncovering unmet needs and championing meaningful relationships through user-friendly products, environments, and systems.

Most of the activity concepts were created by Johnson & Johnson employees, partners from other Johnson & Johnson initiatives, such as the Bridge to Employment (BTE) program, and/or JA Worldwide affiliates.

The activities are not curricula and were not designed to impart standards-based, content-specific knowledge to young people. Rather, the activities are meant to:

- **Spark** interest and excitement in STEM²D subjects and concepts.
- **Offer** hands-on, minds-on, inquiry-based experiences that have real-life applications.
- **Build** foundational skills, like communication, problem-solving, critical thinking, collaboration, and teamwork.
- **Introduce** young people, especially girls, to female role models who confidently demonstrate their success in STEM²D.
- **Expose** young people to exciting STEM²D careers.
- **Convey** that STEM²D is a pathway that can open options for a variety of future careers.

**All STEM²D Student Activities can be downloaded at STEM2D.org.**

# WHAT'S MY ROLE?

Your first role is that of a role model. Exposure to diverse role models—people whose behavior, example, or success can be emulated by others—is a critically important and a powerful message for young women and girls. That is why the STEM²D Student Activities rely on an **Activity Leader**—a Johnson & Johnson employee and/or other volunteer—to facilitate the activities and actively engage with young people.

The **Tell My Story Form** in the back of this overview supports and encourages activity leaders to develop their own STEM²D story and share their accomplishments in a relevant and personal way. Sample colleagues' stories are available at STEM²D.org/mystory.

Although only one volunteer is required for successful implementation of each STEM²D Student Activity, activity leaders may find it valuable to recruit colleagues to tell their stories and help implement the activities. Additional volunteers will show students the diversity of STEM²D careers, provide a broad spectrum of STEM²D role models, and support the student experiences that occur in small groups.

# HOW ARE THE ACTIVITIES STRUCTURED?

Activities are one to four hours in length and focus on one or more of the STEM²D subjects. Written for secondary school students, ages 12–18, all activities follow the same basic agenda or structure:

- **Welcome and introduction:** Activity leaders provide a brief overview of the activity's goals and agenda. Activity leaders, other volunteers, and students also have the opportunity to introduce themselves and get acquainted.

- **STEM²D careers and warm-up activity:** The activity leader provides remarks about his or her education and career; a career video and/or career bios are also shared at this time. This section may also include a self-reflection or brainstorming exercise to help students get ready to learn.

- **Hands-on, minds-on activity:** Activity leaders present key concepts and introduce the specific topic(s). The leader may demonstrate a procedure, facilitate a lab or experiment, give a real-life scenario, or pose a challenge to the students. Students then have the opportunity to engage with their peers in an interactive and fun experience, while activity leaders (and other volunteers, if available) observe, provide assistance and clarifications, and offer positive feedback and suggestions to support learning.

- **Student reflection:** Activity leaders facilitate a self-refection and pair-share discussion centering on the growing awareness of STEM²D careers; key thoughts are shared through a large group debriefing.

- **Review and closing:** Activity leaders offer closing remarks.

Supplemental materials, including an **Activity Leader Checklist**, **Tell My Story Form**, editable **Power-Point**, and **Student Handouts**, are available to support the implementation and delivery of each activity.

All activities and supplemental materials are available at STEM2D.org and can be reproduced or adjusted, as needed.

# HOW IS EACH ACTIVITY ORGANIZED?

Detailed information and step-by-step instructions empower activity leaders to confidently and easily deliver the STEM²D Student Activities. Each activity is formatted and organized in the following manner:

- **Activity description:** One to two sentences previewing the activity.

- **Estimated time:** The amount of time the session typically takes to complete. Activities range in time from one- to four-hours in length. Activity may take more or less time than recommended, depending on your presentation style and the interests and abilities of the young people.

- **Student discoveries:** Three or four bullets highlighting the goals and objectives of the activity—what students will do or learn.

- **Getting ready:** Information and preparatory details for the activity leader:

  - **Materials:** List or photograph of specific materials that are required for the activity, as well as those that are optional.

  - **Estimated materials cost:** The estimates represent the costs activity leaders can expect to incur when completing an activity with 20 students.

  - **Activity leader preparation:** Activity-specific information and instructions that help the activity leader prepare for implementation. A specific Activity Leader Checklist is also available.

- **Step-by-step instructions:** Detailed directions for facilitating the activity.

- **Extended learning:** Additional relevant activities or ways to build on and extend learning. These suggestions can be used by you as a supplemental opportunity with the same group of students or as a "leave behind" for the site representative to provide for additional learning once your time with them done.

Throughout each activity, **Conversation Starters**, **Tips for Working with Students**, and **Tips for Making Connections** are provided to help you engage and support students' ability to make real-life connections. Blank spaces allow for you to write notes, examples, or scenarios from your own education and work to further illustrate the ideas presented.

To support you, **Key Words** and phrases are defined. **Resources and References** on a variety of topics that may support STEM²D volunteers are also provided. Finally, **Activity Leader Reflections** afford you time to reflect on the implementation of the activity, including success and challenges, student learnings, and ways to improve if the activity is implemented again.

# WHERE CAN I USE THE STEM²D STUDENT ACTIVITIES?

The STEM²D Student Activities can be used in a wide variety of places or settings: in a school-based or classroom setting; at an out-of-school learning environment, such as at your organization, a community center, or afterschool program; at a community event; or at an alternative venue, such as a library, museum, or local business.

# HOW DO I GET STARTED?

The following tips provide practical information to help activity leaders use the STEM²D Student Activities:

## 1. Choose the Right Activity

The series of STEM²D Student Activities currently contains more than nine different hands-on, minds-on activities. Each activity features different business segments within Johnson & Johnson and showcases real-life applications.

Although the step-by-step instructions allow you to easily implement and facilitate the student experience, choose an activity that aligns with your expertise or background. If you are not comfortable or unsure about the content, consider choosing another activity or find a colleague to assist in its implementation.

In addition, when choosing an activity, consider:

- **Age of the students:** Ensure that the activity you select is appropriate for the age level(s) you will be working with. If needed, adjust the activity to meet the needs of the students.

- **Materials required:** While most of the selected materials are easily available for free, some materials require advanced planning and purchase (the majority are low-cost, but a select few

may be expensive to acquire for large groups).  Ensure that you can obtain all materials prior to selecting the activity.

- **Setting:** Most activities are hands-on, interactive experiences, so be sure the site/room can accommodate this type of experience.

- **Number of volunteers:** Some activities benefit from additional volunteers to support small-group work or the hands-on experiences.

## 2. Make it Your Own

It is not necessary to read the text word for word. Instead, feel free to modify the text to reflect your personal presentation style and adjust the activities to account for logistical variables, such as the age of the students, group size, and time limitations.

In addition, you can greatly enrich your time with young people by drawing on your own experiences and professional expertise. For example, the Design Challenge activity suggests oral health care as the challenge topic. However, you can choose another topic that aligns with your background, such as skin care, disease management, or minimally invasive surgery. These topical adjustments will not change the overall intent of the challenge.

Finally, it is important to remember that no two communities are alike, and no single activity will meet the needs of all young people. Use local terminology and tailor the activity and PowerPoint to reflect cultural norms, your local community, student diversity, and student knowledge.

## 3. Prepare and Practice

An engaging, interactive, and fun session is no accident. It is the result of solid preparation and practice.

Before working with students:

- Read **Spark WiSTEM²D**, which defines the STEM²D principles and philosophy and provides research-based strategies and tips for engaging and interacting with female students.

- Read the entire text of the activity you are interested in implementing prior to selecting it. Review the activity objectives (Student Discoveries), materials required, and the instructions.

- Preview the suggested video(s). Make sure it is appropriate for the students who will participate in the activity. Select an alternate video or use one of the **My STEM²D Stories** (available at STEM²D.org/mystories), if needed.

- Complete the **Tell My Story Form** at the end of this overview, which will prepare you to talk about your educational and career path with the students.

- Secure the materials for the activity and make photocopies of the **Student Handouts,** based on the total number of students attending.

- Practice your presentation and the hands-on, minds-on activity.

- Review the **Activity Leader Checklist.**

## 4. Get Help with Logistics

Consider talking to and working with a representative at the site where the activity will be held. Although you have the primary responsibility for presenting the content, site representative involvement is important to its success. They are often teachers or other experts in working with young people; respect their authority and experiences and seek their advice.

Ask the site representative to:

- Confirm the logistics: date, time, and location, including the specific space available for the activity. Be sure to exchange contact information to communicate any schedule changes.

- Confirm the number of students who will attend the session.

- Confirm whether permission slips or photograph consent forms are required.

- Verify the ages of the students. Activities are appropriate for young people, ages 12–18. If the age of attendees varies significantly, changes to the activity may be required.

- Verify the site's policies regarding visitors; most schools require checking in at the office. Be advised that in most instances, an educator must be present during any contact with a young adult.

- Offer suggestions for classroom management and how best to deliver the activities to young people.

- Recommend how to group or pair students. Pairing requires that all young people actively

participate. Teams of three or more young people can be created based on prior experience working together or be randomly assigned, keeping in mind that random assignment of students fosters the skills needed to work with new people.

- Assist with any accommodations required for young people with special needs, those who have limited language skills, or those who have difficulty reading.

- Help with acquiring any audiovisual or technological equipment, setting up the room, or ordering refreshments/meals, if needed. Most activities feature hands-on experiences with real-life application, so be sure the site/room can accommodate this type of experience.

- Review or introduce key concepts prior to your presentation to prepare the young people for the activity.

## 5. Review the Activity Leader Tips

For more suggestions, best practices, and successful strategies for working with youth, facilitating groups of students, and communicating effectively with young people, see the **Activity Leader Tips** located at the end of this overview.

## 6. Learn More

All volunteers engaging in Johnson & Johnson's WiSTEM$^2$D initiative or implementing any of the STEM$^2$D Student Activities, should read **Spark WiSTEM$^2$D***.* This essential resource provides background information on the STEM$^2$D philosophy and principles, as well as strategies and tips for working with girls and young women.

## Download Spark WiSTEM$^2$D at STEM2D.org.

# Tell My Story Form

This form will help activity leaders and other volunteers prepare to talk about their STEM²D interests, education, and career path in a relevant and personal way.

## ABOUT YOU

Name: _____

Job Title: _____

Company: _____

When/Why did you become interested in STEM²D? _____

_____

_____

What do you hope young people, especially females, will get out of this activity? _____

_____

## FUN FACT

Share a little about your background. Ideas:

- o  Share a memory from childhood when you first had your spark or interest in STEM²D.

- o  Detail your journey, highlighting what you have tried, what you learned, steps to success, etc.

- o  Failures or set backs are also great to talk about—difficulties, and/or challenges and how you overcame them.

## EDUCATION AND CAREER PATH

What classes/courses did you take in secondary school and in college that helped or interested you most? _____

_____

How did you know you wanted to pursue a STEM²D career? _____

_____

What was your postsecondary path, including the institution you attended and your degree? *If you switched disciplines, make sure you explain why.* _____

_____

What your current position entails. *Be sure to include how you use STEM²D during a typical work day.* _____

_____

# Activity Leader Checklist

The following checklist helps activity leaders plan and prepare to
conduct the **STEM²D Student Activities.**

### DID YOU . . .

☐ Read **Spark WiSTEM²D**? *This is essential reading for all volunteers interested in working with youth, as it provides important background knowledge about STEM²D, strategies for engaging female students, and tips for working with groups of students.*

☐ Visit the implementation site and observe the young people? *(optional)*

☐ Meet with and finalize the logistics with the site representative?

    ☐ Confirm the date, time, and location of the activity?

    ☐ Confirm the technology needs? *Do you need to bring a computer and a projector to show the PowerPoint? Or, does the site have one that you can borrow? Does the site have internet access? Will you be able to use it during the session?*

    ☐ Confirm the number of students attending? *Knowing this will help you decide how to separate the students into teams and/or pairs, as well as the appropriate materials to purchase.*

☐ Recruit additional volunteers, if needed?

☐ Prepare for the activity:

    ☐ Read the entire activity text prior to implementation?

    ☐ Customize the activity and tailor the PowerPoint, if desired, to reflect your background and experiences, as well as the cultural norms and language of the students in your community.

    ☐ Preview the suggested video(s) and make sure it is appropriate for the students who will participate in the activity?

    ☐ Complete the **Tell My Story Form**, which prepares you to talk about your educational and career path with the students? If desired, include key points about your story on the PowerPoint (see **Tell My Story Slide**).

    ☐ Determine how you will assign the teams? *It is recommended that you randomly assign students to each team; this will foster the skills needed to work with new people*.

☐ Obtain the required materials (see the **Materials** and **Estimated Materials Costs** sections) and photocopy the **Student Handouts**?

☐ Practice your presentation, including the hands-on, minds-on activity?

☐ Set up the site appropriately for the activity?

☐ Obtain and collect permission slips and photo release forms for conducting the activity, if applicable?

☐ **HAVE FUN!**

ACTIVITY LEADER TIPS
The following tips provide a variety of practical information to help first-time activity leaders,
as well as those who would like a refresher, prepare for, engage with, and inspire youth.

# GET SET!

## What It Means: Prepare and practice.

| TIPS | WHAT CAN I DO? |
|---|---|
| **Practice! Practice! Practice!** | • Prepare your remarks in advance. |
| | • Do a trial run. Complete all calculations, labs, experiments, and/or real-life scenarios prior to presenting to young people. |
| | • Secure materials and make photocopies of any student handouts, based on the total number of students attending. |
| **Be student centered.** | • Tailor your remarks to meet student needs. |
| | • Use language, examples, and analogies that connect with young people. |
| | • Provide the material in an attention-capturing manner. |
| | • Secure materials and make photocopies of any student handouts, based on the total number of students attending. |
| | • Use PowerPoint slides or other visuals to support your presentation. |
| **Tell your story.** | • Be yourself. |
| | • Talk about your early aspirations, your current job, and how you got it. |
| | • Use the **Tell My Story Form** (available at www.STEM2D.org), which will prepare you to talk about your educational and career path. |
| **Think about pairing students or using groups.** | • Consider randomly assigning students.<br>➢ **TIP!** Diverse groups are better at solving problems because they expect all members to share their unique perspectives, experiences, and background information to solve the problem or complete a task. |
| | • Try assigning roles to each team members: timekeeper, reporter, recorder, leader, etc. |

# GO!

## What It Means: Implement! Start engaging with youth!

| TIPS | WHAT CAN I DO? |
|---|---|
| **Be conscious of time.** | • Arrive early! This will give you time to set up the room, review your plan, prepare visual aids, and test any electrical equipment, as well as relax. |
| | • Begin on time and end on time. |
| | • Provide a 10- to 15-minute break every 1.5 hours. |
| **Get off to the right start.** | • Wear business-appropriate attire; look like the expert that you are. |
| | • Greet the students in a friendly and professional manner as they enter the room. |
| | • Introduce yourself to each student. Give your name, ask for the student's name, smile, shake hands (if appropriate), and maintain eye contact. This will make everyone more relaxed. |
| | • Consider using name tags or table tents. |
| | • Determine what the young people already know about a concept or topic:<br>➢ **TIP!** Ask: What do you know about this topic? Do you have any experience working with this topic? |
| **Set the stage.** | • Share expectations. Explain to the young people that there are established expectations that ensure the success of a hands-on or interactive activity, project, lab, etc.<br>➢ **TIP!** Sample expectations: Everyone participates and shares her or his knowledge; participants must work together and help one another; and everyone listens with respect. |
| **Give clear and logical directions.** | • Ask whether clarification is needed. |
| | • Check frequently for understanding by asking process questions. |
| | • Give directions before separating the large group into pairs or teams. |
| | • When particular skills are required, such as mathematical calculations, provide an example or demonstration of the process before asking young people to solve the problem. |

# ACTIVITY LEADER TIPS

| TIPS | WHAT CAN I DO? |
|---|---|
| **Give participants a positive learning experience.** | • Involve everyone. Let hesitant students know that you value their contributions, but that silence is also acceptable. |
| | • Avoid criticizing, placing value, or rejecting wrong answers. |
| | • Use non-verbal recognition, like nodding, smiling, and gestures. |
| **Ask open-questions.** | • Encourage participants to view one another as resources.<br>➢ **TIP!** When a participant makes a comment or asks a question, ask the group, "What do you think?" or "Would anyone like to respond to what was just said?" |
| | • Avoid questions with yes-or-no answers.<br>➢ **TIP!** Sample open-ended questions are: What do you think? What ideas does this conversation spark for you? What would you recommend? |
| | • Ask one question at a time. |
| | • Wait at least five seconds for an answer. |
| **Listen actively.** | • Do not answer your own questions. |
| | • **TIP!** Use the following active-listening strategies:<br>➢ Paraphrase: Repeat a question or comment made by the student. This helps all participants to hear what has been said, as well as validate that the student was heard.<br>➢ Mirror: Capture the student's exact words.<br>➢ Encourage: Create an opening for the student to say more. Try: Can you give an example? What questions does this raise for you?<br>➢ Introduce intentional silence: Give a few seconds of extra time for students to determine what they want to say. |
| **Encourage and engage female students.** | • Give recognition for hard work. |
| | • Provide prescriptive, informational feedback<br>➢ **TIP!** Instead of a simple "good job," tell students why or describe how they are doing. |
| | • Encourage girls to take leadership roles. |
| | • Spark their interest!<br>➢ **TIP!** Use fantasy scenarios, real-world problems, popular culture, and even day-to-day life examples. |
| | • Encourage and promote spatial reasoning, critical thinking, and communication skills. |

# REFLECT!

## What It Means: Consider and think.

| TIPS | WHAT CAN I DO? |
|---|---|
| **Have students summarize what they learn.** | • Provide time for students to reflect on what they learned and how it affected their STEM²D beliefs, attitudes, interests, and confidence. |
| | • Encourage students to reflect on how STEM²D can contribute to society, solve global and local problems, and connect to their everyday lives. |
| **Set aside time for self-reflection.** | • Reflect back on both the strengths and challenges of the experience, as well as your implementation techniques; make changes, if necessary, for future sessions. |

# TIPS FOR DEALING WITH THE UNEXPECTED
## What It Means: What to do when things don't go as planned.

| TIPS | HOW DO I RESPOND? |
|---|---|
| **A student gets off the topic.** | • That is very interesting. Let's get back to the original question we were addressing. |
| | • I appreciate your comment. Since our time is limited, let's stay focused on the topic at hand. |
| | • Let's stay focused so that we can keep moving. |
| **One student wants to dominate the conversation.** | • Can we hear from someone else who sees it differently? |
| | • Has anyone else here had a similar experience? |
| | • What do other people hear (insert name) saying? |
| | • You have made some good points. Let me recap what you have said. |
| | • Let's hear from this side of the room. (But try not to call on participants by name.) |
| | • This question is only for the (insert a characteristic, such as students wearing blue, girls wearing a necklace, students with blue eyes, etc.). |
| **Students quiet** | • Let's hear from some of you who have not shared yet. Do you agree with what you just heard? |
| **Students are talking at the same time.** | • We want to hear what everyone has to say, but we will not be able to hear anyone if we talk over one another. Distinguish between activelearning and genuine engagement and disruptive/inattentive behavior. Quiet is not necessarily good, nor is loud / talkative necessarily bad. Rigorous discussions or activity often are indicators of learning. |
| | • Let's share air time so that everyone gets a chance to speak. |
| | • We do not want to miss a great comment. |
| **A student is disagreeable.** | • Everyone has the right to his/her own thoughts and feelings on the subject. Perhaps what we talk about next will be more in alignment to your ideas. |
| | • It is important to listen to everyone's opinions. |
| | • It sounds like you have some strong feelings about this subject. I would be glad to discuss this with you later. |
| | • My experience (or the research) shows it can work. I would be happy to share my experience (or the research) with you after this session. |

***Leave student discipline to the site representative.***

# Acknowledgements

Steve Debenport/Getty Images

# WiSTEM²D Partners
## Johnson & Johnson partners with the following organizations:

### FHI 360

FHI 360 is a nonprofit human development organization dedicated to improving lives in lasting ways by advancing integrated, locally driven solutions. FHI 360 programs combine evidence with on-the-ground experience to deliver maximum efficiency and impact. FHI 360's impact is amplified through the synergy of partnerships. The "360" symbolizes our inclusive approach to sustainable success, attained only when we partner with community-based organizations, secondary schools, and higher education institutions, the private sector, and the communities we serve. FHI 360 serves more than 70 countries and all U.S. states and territories. FHI 360's National Institute for Work and Learning (NIWL) partners with Johnson & Johnson on the WiSTEM²D initiative.
*For more information, visit: fhi360.org.*

### JA Worldwide

As one of the world's largest youth-serving NGOs, JA Worldwide activates youth for the future of jobs. Through the delivery of hands-on, blended learning in financial literacy, work readiness, and entrepreneurship, we empower young people to grow their entrepreneurial ideas, hone their work skills, manage their earnings, and secure better lives for themselves, their families, and their communities. With more than 100 member countries, the JA Worldwide network is powered by over 470,000 volunteers and mentors, who serve more than 10 million young people around the world each year.
*For more information, visit: jaworldwide.org.*

### Smithsonian Science Education Center

The Smithsonian Science Education Center—the only unit at the Smithsonian Institution that is solely dedicated to formal science education reform—transforms and improves the teaching and learning of science for secondary-school students in the United States and throughout the world. The Smithsonian Science Education Center builds awareness for preK-12 science education reform among state and district leaders, conducts programs that support the professional growth of teachers and school leaders, and engages in research and curriculum development (including its comprehensive K-8, research-based science curriculum programs).

*For more information, visit: ScienceEducation.si.edu.*