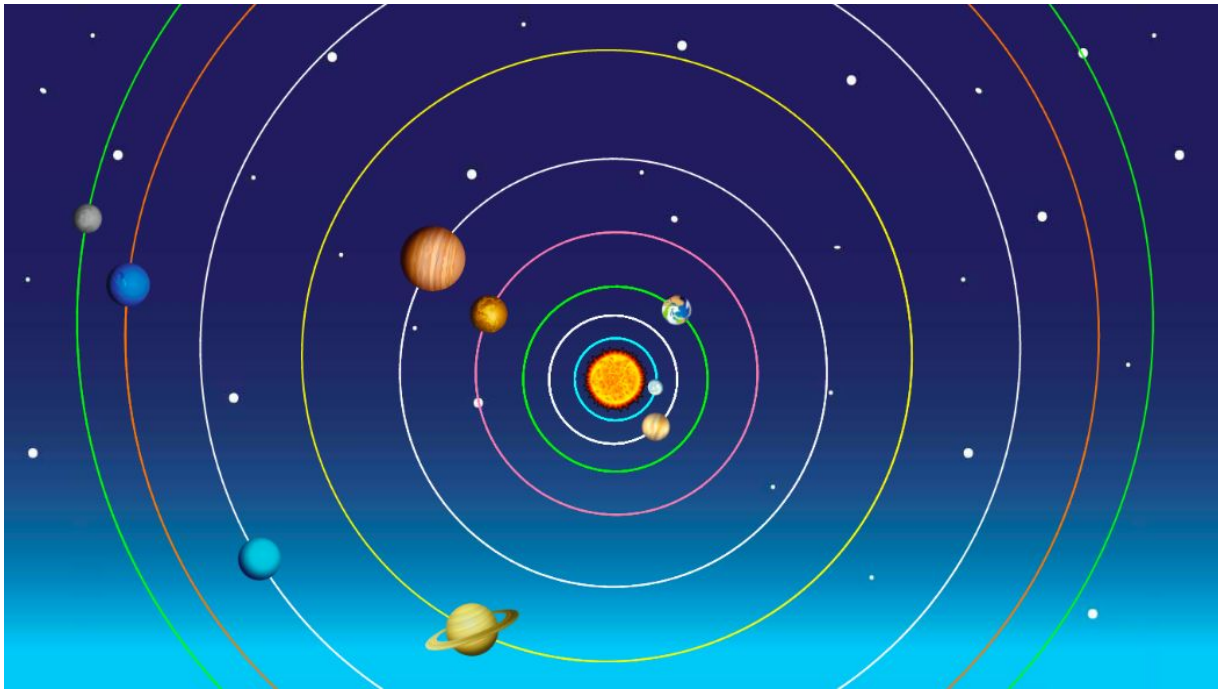
Solar System Teacher Guide



Summary

- Coding skill level: **Intermediate**
- Recommended grade level: **Grades 3-8 (U.S.), Years 4-9 (U.K)**
- Time required: **40 minutes**
- Number of modules: **1 module**
- Coding Language: **Block-based**

Teacher Guide Outline

Welcome!

Reach for the stars! In this lesson, students will follow a step-by-step tutorial to program an interactive model of the Solar System. Activities include changing the background, adding background music, programming different planets to orbit the sun, using the pen to draw colorful orbits, and labeling the planets. For an additional coding challenge, ambitious coders can complete the bonus activities in "Steps 9-11" of the tutorial. **Note:** Students are provided the necessary code blocks to complete the bonus activities.

By the end of the lesson, students will have experimented with coding concepts (e.g., simple sound playing, simple loops, advanced costume handling, delays, simple motion, direction and turning, simple drawing) while creating an interactive model of the Solar System!

How to Prepare

This activity is designed for self-directed learning. Your role will be to help students individually and facilitate as students complete the coding activities on their own. The best way to prepare is to:

1. **Familiarize yourself with the material.** After selecting your Tynker lesson (e.g., Solar System), read through this teacher guide and complete the activity before assigning it to students. This will allow you to troubleshoot anything in advance and plan for potential questions from your students.
2. **OPTIONAL: Sign up for a teacher account.** Although an account is NOT required, creating a free teacher account will allow you to access teacher guides, answer keys, and tons of additional resources. You'll also be able to create free accounts for your students, monitor their progress, and see their projects.
3. **OPTIONAL: Create student accounts.** From your teacher account, you can easily create free student accounts for all your students. This will allow them to save their projects and progress, so they can continue coding when they get home! Again, this is not necessary to complete the Solar System lesson.

Activity

Overview

Objectives

Students will...

- Apply coding concepts such as simple sound playing, simple loops, advanced costume handling, delays, simple motion, direction and turning, simple drawing
- Use code blocks to create an interactive model of the Solar System

Materials

- **For web:** Computers, laptops, or Chromebooks (1 per student)

- **For mobile:** iPads or Android tablets (1 per student)

Vocabulary

- **Code:** The language that tells a computer what to do
- **Actor:** A Tynker character or object that can talk and interact with others
- **Stage:** The background of the project where the Actors are placed
- **Sequence:** The order in which steps or events happen
- **Loop:** An action that repeats one or more commands over and over
- **Infinite loop:** A loop that repeats one or more commands forever and does not end until the program stops
- **Command:** A specific action or instruction that tells the computer to do something
- **The Solar System:** Our system of eight planets and other objects that move around (orbit) the Sun

U.S. Standards

- **CCSS-ELA:** RI.3.7, RF.3.4, RF.3.4.A, SL.3.1, RF.4.4.A, RF.1.4.A, RF.4.4, SL.4.1, RF.5.4.A, RF.5.4, SL.5.1, RI.6.4, RI.6.7, SL.6.1, SL.7.1, SL.8.1
- **CCSS-Math:** MP.1
- **CSTA:** 1B-AP-08, 1B-AP-11, 1B-AP-12, 1B-AP-15, 1B-AP-17, 2-AP-13, 2-AP-16
- **CS CA:** 3-5.AP.10, 3-5.AP.13, 3-5.AP.14, 3-5.AP.17, 6-8.AP.13, 6-8.AP.16
- **ISTE**: 1.c, 1.d, 4.d, 5.c, 5.d, 6.b

U.K. Standards

National Curriculum in England (computing):

- **Key Stage 2 (Years 4-6)**
    - Design, write and debug programs that accomplish specific goals, including controlling or simulating physical systems; solve problems by decomposing them into smaller parts
    - Use logical reasoning to explain how some simple algorithms work and to detect and correct errors in algorithms and programs
    - Understand computer networks, including the internet; how they can provide multiple services, such as the World Wide Web, and the opportunities they offer for communication and collaboration
    - Use technology safely, respectfully and responsibly; recognise acceptable/unacceptable behaviour; identify a range of ways to report concerns about content and contact
- **Key Stage 3 (Years 7-9)**
    - Design, use and evaluate computational abstractions that model the state and behaviour of real-world problems and physical systems
    - Create, reuse, revise and repurpose digital artefacts for a given audience, with attention to trustworthiness, design and usability
    - Understand a range of ways to use technology safely, respectfully, responsibly and securely, including protecting their online identity and

privacy; recognise inappropriate content, contact and conduct, and know how to report concerns

Getting Started (10 minutes)

1. Tell students that they are going to create their own Solar System model using Tynker!
2. Review the order of the planets, starting with the planet closest to the sun: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune. If you would like to include Pluto, its position is after Neptune.
3. *Optional:* Create a silly sentence or song to help students remember the order of the planets. For example, "**M**y **v**ery **e**ducated **m**other **j**ust **s**ang **u**s **n**ine **p**oems."
4. As a class, create a list of facts about the different planets in the Solar System. Write the facts on the classroom board so students can use this as a resource for their project. For example, make a note that Pluto has been demoted from its planet status and is now considered a dwarf planet.

DIY Module (30 minutes)

This lesson has one DIY (do-it-yourself) module. Facilitate as students complete the Solar System module on their own:

1. **Solar System (DIY)**

- In this DIY project, students will create an interactive model of the Solar System.
- Tell students to follow the step-by-step instructions and drag code blocks from the tutorial tab to the center coding area.
- "Steps 4-5" of the tutorial require students to manually change the value of the "move," "turn," and "wait" code blocks. **Note:** Students are provided the necessary values, which are located towards the bottom of "Step 5."
- Do students want to modify their project? Direct their attention to "Steps 9-11" of the tutorial, which include bonus activities. Here are some hints to help your students get started:
    - **Add extra information-** Tell students to use the provided "show dialog with" code block and manually type in facts about the planets. Remind students to use the facts on the classroom board (as noted in the "Getting Started" section of this teacher guide) as a reference.
    - **Draw rainbow orbit paths-** Tell students to use the provided "change pen color by" code block, and explore what happens if they increase the number inside the code block.
    - **Change the planet Actors-** Tell students to draw their own planet Actors. If students are struggling, ask them to click this link, which includes a video on how to draw an Actor: https://www.tynker.com/support/videos.

Extended Activities

Discussion

Ask your students...

- What is something you learned today about the Solar System?
- If your students were to give one piece of advice to someone drawing their own Actors, what would it be?
- Who can list and describe some of the code blocks from today's coding activity? (Example: The "clear" code block removed the planets' orbit lines.)
- Who can describe how they experimented with their code? Discuss obstacles and successes.

Solar System: Trivia

Ask students if they know the answer to these Solar System trivia questions:

- True or false: All planets in the solar system have only one moon. (Answer: False.)
- Which planet has the most moons? (Answer: Jupiter.)
- True or false: Mars is the closest planet to the sun. (False; Mercury is the closest planet to the sun.)
- How many planets in the Solar System have rings? Bonus: Who can name them? (Answer: 4; Uranus, Jupiter, Saturn, and Neptune.)
- Optional: Encourage students to come up with 3-5 of their own Solar System trivia questions and quiz a friend.

Going Beyond Solar System

If your students enjoyed Solar System, they're sure to enjoy the rest of what Tynker has to offer! Tynker offers a complete premium solution for schools to teach computer science. Over 400 hours of lessons are available to take K-8 students from block coding to advanced text coding. We offer tons of resources for teachers, including comprehensive guides, free webinars, and a forum to connect with other educators.

Do More with Tynker

With Tynker, kids don't just acquire programming skills—they explore the world of possibilities that coding opens up. Tynker has several interest-driven learning paths that make coding fun, both inside and outside the classroom:

- **Coding and Game Design:** Your students can use Tynker Workshop, a powerful tool for crafting original programs to make games, stories, animations, and other projects. They can even share their work with other kids in the Tynker Community.
- **Drones and Robotics:** Tynker integrates with connected toys, including Parrot drones and Lego WeDo robotics kits, so kids can see their code come to life.

- **Minecraft:** Tynker integrates with Minecraft so your students can learn coding through a game they love. Tynker offers skin and texture editing, as well as a custom Mod Workshop that lets kids try their original code in Minecraft.

Tynker for Schools

Used in over 80,000 schools, our award-winning platform has flexible plans to meet your classroom, school, or district needs. All solutions include:

- Grade-specific courses that teach visual coding, JavaScript, Python, robotics and drones
- A library of NGSS and Common Core compliant STEM courses that are great for project-based learning
- Automatic assessment and mastery charts for whole schools and individual classes and students
- Easy classroom management with Google Classroom and Clever integration
- Professional training, free webinars and other teacher training resources

Need help getting Tynker started at your school? Contact us to learn more about teaching programming at your school with Tynker!

Help

Need help? Below you'll find answers to frequently asked questions about using Solar System.

How do I prepare for Solar System?

1. **Familiarize yourself with the material.** After selecting your Tynker lesson (e.g., Solar System), read through this teacher guide and complete the activity before assigning it to students. This will allow you to troubleshoot anything in advance and plan for potential questions from your students.
2. **OPTIONAL: Sign up for a teacher account.** Although an account is NOT required, creating a free teacher account will allow you to access teacher guides, answer keys, and tons of additional resources. You'll also be able to create free accounts for your students, monitor their progress, and see their projects.
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Who is this activity for?

Solar System is intended for students in grades 3-8 with some coding experience.

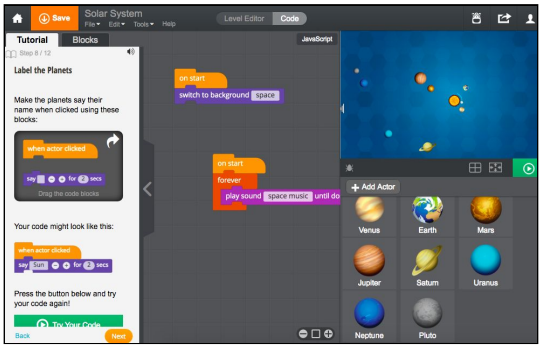
Do I need to create Tynker accounts for my students?

No, you do not need to create a Tynker accounts for your students.

What devices do I need?

- **For web:** Computers, laptops, or Chromebooks (1 per student) with an internet connection
- **For mobile:** iPads or Android tablets (1 per student) with an internet connection

How do my students code their projects?



The Solar System DIY module includes a workspace for students to code their projects. The section on the left is a tutorial tab that gives step-by-step directions, describes what is happening in each step, and provides the necessary code blocks. Tell students to follow the step-by-step instructions and drag blocks from the tutorial tab to the center coding area.

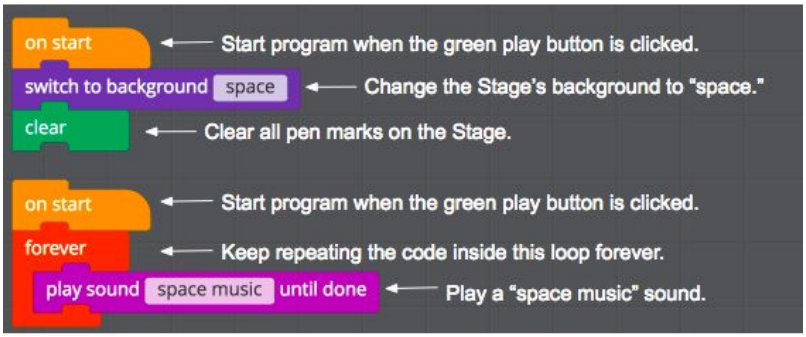
What will my students learn?

Students will combine creativity, imagination, and coding concepts (i.e., simple sound playing, simple loops, advanced costume handling, delays, simple motion, direction and turning, simple drawing) to create an interactive model of the Solar System! “Steps 9-11” of the tutorial include bonus sections that encourage students to expand on their project while experimenting with new code blocks. In this process, students will develop debugging and logical reasoning skills.

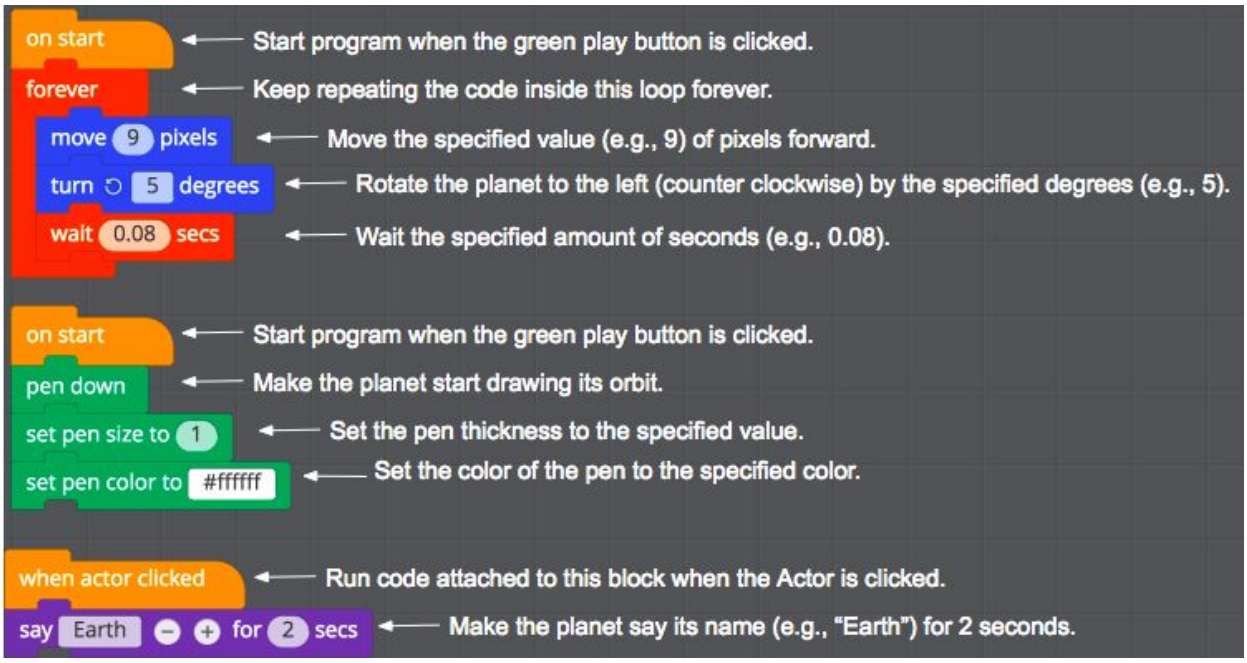
What do the code blocks do?

Below is pseudocode for the Stage and Earth:

Stage-



Earth-



Note: Students will add the same code to the following Actors: Mars, Jupiter, Saturn, Uranus, Neptune, and Pluto. Students will also need to manually change the values of the "move," "turn," and "wait" code blocks for each planet, as stated in "Step 5" of the tutorial:

- Mars: move 11 pixels; turn 5 degrees; wait 0.1 seconds
- Jupiter: move 10 pixels; turn 2.4 degrees; wait 0.2 seconds
- Saturn: move 12.5 pixels; turn 2.1 degrees; wait 0.3 seconds
- Uranus: move 16 pixels; turn 2 degrees; wait 0.4 seconds
- Neptune: move 19 pixels; turn 2 degrees; wait 0.5 seconds
- Pluto: move 21 pixels; turn 2 degrees; wait 0.5 seconds

How can I contact the Tynker support team?

If you have any issues or questions, send us an email at support@tynker.com.