Intelino Snap Training

Teacher's Companion

This companion contains:

1. Snap Training Overview (2 min read)

Grades:

Pre-reader through 5th, Ages: 3-12,
in 4 age-segmented versions

Time:

4 sessions, 45 min each

Tools:

intelino J-1 starter set(s), no screens required

Method:

mostly self-guided for K-5,
teacher-assisted for pre-readers

Experience:

no intelino or coding experience required for teacher or student

What will students learn?

This course teaches your students the **basic functions of the intelino J-1 train system** as well as **STEM skills** in **four sessions** (45 minutes each). They will learn how to build tracks, operate the train engine and wagon, and how to make commands using snaps. Equal emphasis is put on gaining additional STEM skills during this process. Students will improve their logical and critical thinking skills. Math and science topics are also parts of the course. Please see the list of standards for each session listed below.

Who is this course for?

The sessions are designed for **elementary school students** (grades K-5, ages 5-12) and **pre-readers** (ages 3-5). Students as well as teachers do not need to have any previous programming experience or be familiar with intelino's J-1 train system.

To help you customize this course to your students' needs, there are four different **age-segmented** versions to choose from (Pre-reader, K-1, 2-3, 4-5). They are leveled according to academic standards and students' reading and cognitive abilities. (Version K-1 is available now, we are working on the others!)

This course is completely **screen-free**. It makes use of tactile action snaps to code and control the train. You may be aware that there is also an app available to control the train. This app can be used in the classroom as well, and its features are introduced in the **intelino App Training** course (coming soon).

More info about this course

The sessions are designed as **worksheets** for the students. All K-5 sessions can be **self-guided** and especially older kids will have no trouble finishing on their own. However, you may want to review the instructions with Kindergarten and 1st graders as they are still working on their reading skills. For pre-readers, teacher guidance is necessary. All sessions have opportunities for reflection and discussion throughout and at the end of each session.

All sessions also have **teacher instruction guides** which you can find in this document. These point out how to prepare for the session, give background about the technology and subject, and have tips to set you up for successful classroom sessions.

The course is designed to be fun and engaging in order to encourage learning and take the fear out of new technology and programming. To get students excited to finish all sessions, we created a **Training Certificate** (included with the worksheets) that you can print out for each student. After a student completes a session successfully, simply put a stamp or checkmark in the certificate. At the end of the course they will be a certified J-1 expert!

Where do I go from here?

After completing this course, your students will be ready to take on other activities with J-1 and action snaps. Please check out the **project ideas** (coming soon)!

As mentioned, there is also an app available to control the train. This app opens up more possibilities of programming the train's behavior and will introduce students to further programming concepts. Its features are introduced in the **intelino App Training** course (coming soon).

If you have any questions about intelino, this course, or simply want to share your experience with us, please contact us at **edu@intelino.com**. We're always happy to hear how intelino worked in your classroom!

2. Preparation and Tips (1 min read)

Before you begin

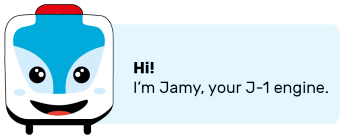
Please take a look at the **Teacher's Quick Start Guide** to get your intelino trains ready for your classroom. The guide has information about charging and updating the trains and tips for classroom management.

Before each session

Please review the **teacher instruction guide** for the session that you are planning to teach. The prep sheet will have all the info about gathering supplies, details about the session, and suggestions for related topics.

Worksheet structure

Jamy's talk: The parts with the blue background and cartoon image of the engine are representing Jamy, an Intelino J-1 engine, talking to the students. Jamy is there to guide them through the session. Younger students that are not experienced readers may skip these parts and listen to teacher instructions instead.



Prompts and checkmarks: The red triangles are alerting students to an action they need to do. For K-5, they can also put a checkmark next to "DONE" to keep their place more easily.

What to look out for

Direction: It's always important for the engine to go in the right direction to see the snap commands properly. The direction of movement is indicated throughout the course with a yellow arrow. Remind students frequently!

Snaps: Make sure they are always clicked in all the way. Otherwise, the engine may not read them properly. Always put them into the exact position that is indicated on the images in the sessions. The students may be asked to add snaps or modify the commands, so having them placed properly avoids confusion!

3. Standards and Learning Objectives (1 min read)

Sessions: 1. The Basics, 2. Commands, 3. Steering, 4. Wagons

What will they learn?

1. The Basics

- Building a track
- Turning J-1 off/on
- Driving forwards and backwards
- Making commands with snaps
- Pause and speed commands
- The technology behind: color sensors

2. Commands

- Snap command rules and tips
- Reverse command
- Debugging
- Sequential thinking/programming
- Time tables

3. Steering

- Directional commands
- Charts and tally marks
- Random decisions

4. Wagons

- Driving with the wagon
- Controlling the wagon with snap commands
- Coded instructions
- The technology behind: magnets and electromagnets

Standards*

The Basics

Common Core: CCSS.MATH.PRACTICE.MP1, CCSS.MATH.PRACTICE.MP3, CCSS.MATH.CONTENT.K.CC.A.1, CCSS.MATH.CONTENT.K.CC.B.4, CCSS.MATH.CONTENT.K.CC.B.5

CSTA: 1A-CS-03, 1A-AP-08, 1A-AP-09, 1A-AP-15, 1B-CS-01, 1B-AP-16
ISTE: 1a, 1d, 5a-d, 6b, 7b, 7c

NGSS: K-PS2-1

Commands

Common Core: CCSS.MATH.PRACTICE.MP1, CCSS.MATH.PRACTICE.MP3, CCSS.MATH.CONTENT.K.CC.A.1, CCSS.MATH.CONTENT.K.CC.B.4, CCSS.MATH.CONTENT.K.CC.B.5

CSTA: 1A-CS-03, 1A-AP-08, 1A-AP-09, 1A-AP-10, 1A-AP-14, 1A-AP-15, 1B-AP-10, 1B-AP-15, 1B-AP-16

ISTE: 1a, 1d, 5a-d, 6b, 7b, 7c

Steering

Common Core: CCSS.MATH.PRACTICE.MP1, CCSS.MATH.PRACTICE.MP3, CCSS.MATH.PRACTICE.MP4, CCSS.MATH.CONTENT.K.CC.A.1, CCSS.MATH.CONTENT.K.CC.B.4, CCSS.MATH.CONTENT.K.CC.B.5, CCSS.MATH.CONTENT.K.CC.C.6, CCSS.MATH.CONTENT.1.MD.C.4, CCSS.MATH.CONTENT.6.SP.B.5.A, CCSS.MATH.CONTENT.7.SP.C.7

CSTA: 1A-CS-03, 1A-DA-06, 1A-AP-07, 1A-AP-08, 1A-AP-09, 1A-AP-10, 1A-AP-11, 1A-AP-12, 1A-AP-15, 1B-DA-07, 1B-AP-10, 1B-AP-11, 1B-AP-16

ISTE: 1a, 1d, 5a-d, 6b, 7b, 7c

Wagons

Common Core: CCSS.MATH.PRACTICE.MP1, CCSS.MATH.PRACTICE.MP3, CCSS.MATH.CONTENT.K.CC.A.1, CCSS.MATH.CONTENT.K.CC.B.4, CCSS.MATH.CONTENT.K.CC.B.5

CSTA: 1A-CS-03, 1A-AP-08, 1A-AP-09, 1A-AP-10, 1A-AP-14, 1A-AP-15, 1B-CS-01, 1A-AP-10, 1B-AP-15, 1B-AP-16

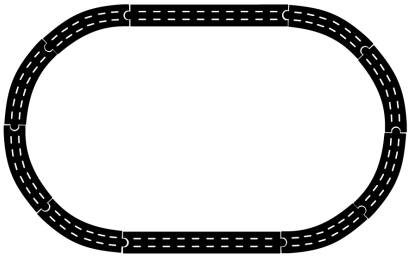
ISTE: 1a, 1d, 5a-d, 6b, 7b, 7c

NGSS: K-PS2-1, 3-PS2-3, 3-PS2-4

* Contact us at edu@intelino.com for a list of international standards.

Instruction Guide

Session 1: The Basics



Learning Outcomes: This session teaches the basic operations of the Intelino J-1 system: tracks, operation of the engine, and an introduction to snap commands.

Session Time: 45 min

Prepare

- ➜ Review session 1
- ➜ Fully charge all engines
- ➜ Gather supplies for each group:
  - Train box with engine, tracks, and snaps (leave out wagon and command sheet)
  - Session printout
  - Pencil, eraser

Tips

Command sheet: Intelino J-1 starter packs come with a sheet that explains all action snap commands. This sheet is being used for sessions 2-4, but is not used in this session. Actually, we found that having the sheet available for this session interferes with the students' learning process, so please make sure that they don't use it in this session!

Building a track: When building the loop, the tracks can be clicked together in two different ways. We found that kids like to push the pieces together while they are lying flat on the table, but they can also lift one piece and push it down to connect to the other piece.

Turning J-1 off/on: The power button has two different functions and students may need to practice these.
Long press (until music sounds) turns the engine on and off. Short press makes the engine start and stop driving.

Making commands with snaps: The most important fact that we want students to figure out in this session is that commands, other than most directional commands, need to start with a white snap.

Direction: The direction the engine is traveling in is important here because it needs to see the white snap first. Make sure that students are driving the train in the right direction! The exercise when they first use the white snap will not work otherwise!

Pause commands: There are three different pause commands that make the engine stop for 2, 5, or 10 seconds. Students can tell them apart by counting the sounds animations the engine makes while stopping. Every sound counts for one second.

Reflection

The reflection part of the session is a chance to recap the material learned and to talk about challenges and how to overcome them. The questions we added can be used as conversation starters. It can also be used to go deeper into certain related subjects. We recommend the teacher to lead this portion for the entire class. Below you will find background and answers to the talking points for the reflection of session 1.

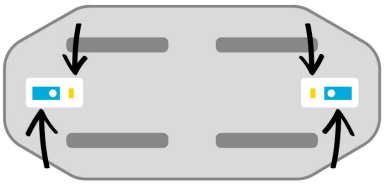
How does it work?

The image points out the color sensors underneath the engine. These sensors capture the incoming light and send the data to the engine. Then, the engine determines (through an algorithm that has been programmed) what the colors are. The engine uses this information to figure out what command it is reading and then performs the corresponding action.

There are white LEDs next to the color sensors because it's dark underneath the engine! These LEDs are bright so remind students to turn off the engine if the light is bothering them.

Why does Jamy have sensors on both ends?

The engine has color sensors on both ends to be able to read commands when driving in both directions. If it had a sensor only in the front, then it may not be able to activate commands in time when driving backwards.



What is important when making commands with snaps?

This is a chance to make sure students understand that they have to start a command with a white snap. The only commands that don't start with a white snap are directional commands for turning right/left or going straight. These commands start with a cyan snap that's permanently placed on the split tracks.

STEM Extensions

➜ **Science: Push Forces.** You may use the fact that the engine starts by pushing it to review and relate this to pull forces. (NGSS K-PS2-1)

➜ **Science: Light Waves.** Expand on the light waves that the color sensor sees and how that can be used to transfer information. (NGSS 1-PS4-2, 4-PS4-3)

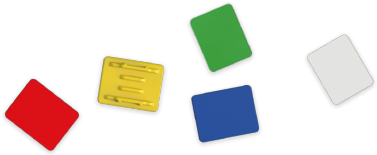
➜ **Science: Properties of the Eye:** Explain how the color sensor is similar to the human eye and how objects are seen. (NGSS 4-PS4-2)

Instruction Guide

Session 2: Commands

Learning Outcomes: This session goes deeper into snap commands. Rules and tips for snap commands are explored through a game challenge that introduces students to sequential thinking and debugging a program.

Session Time: 45 min



Prepare

- ➜ Review session 2
- ➜ Fully charge all engines
- ➜ Gather supplies for each group:
  - Train box with engine, tracks, snaps, command sheet (leave out wagon)
  - Session printout
  - Pencil, eraser
  - Pair of scissors
  - Scotch tape

Tips

Command sheet: Make sure that students have the command sheet for this lesson.

Extra supplies: scissors and scotch tape. Students need to cut out the activity stops and lay them next to the track. Have them secure the activity stop cards to the table with a bit of scotch tape.

Direction: As in the last session, the direction the engine travels in is important. Make sure students remember that the direction is indicated by the yellow arrow.

Reverse command: This command will be new to them. All other commands should be known from last session.

Command rules: Students will find out that there is something wrong with every command on the track. This is how they figure out what the rules for commands are. Have them fix one command at a time, starting with the one that the engine sees first. This process is actually debugging and is an essential programming tool. You can talk about the term and process in the reflection.

Jamy's schedule: The students will need to study the schedule to understand what Jamy has to do and in what sequence. Kindergartners and 1st graders may not be familiar with tables yet, so remind them that Jamy needs to complete the task in the sequence from top to bottom.

Reflection

Train Driving Exam

The three test questions go over the snap rules that students discovered in the sessions.

What did you learn?

These are the conclusions of the above test. We want to repeat them to better remember the rules.

What is another word for "trying things to fix a problem" in computer speak?

This is an opportunity to discuss debugging. A software engineer usually spends a lot of time debugging (or fixing problems), so it's important to point out this concept. You can learn more about the process and where the term comes from here bbc.com/bitesize/articles/ztkx6sg.

Sequential thinking

We didn't print a reflection question for it and you may not want to introduce the term just yet, but it may be good for students to realize that the order of the commands is important. Both Jamy's schedule and the way the problems were debugged make this clear.

STEM Extensions

➜ **Engineering: city planning.**

Have students create a track design and train schedule that solves a specific problem a city may have, for example improve commute times from some locations to others. (NGSS K-2-ETS1-3, 3-5-ETS1-1, 3-5-ETS1-2, 3-5-ETS1-3)

Instruction Guide

Session 3: Steering

Learning Outcomes: In this session, students are observing that, at a split, the train chooses the direction randomly. They then learn how to steer the train at splits. A final challenge track tests their knowledge of directional and other commands.

Session Time: 45 min

Prepare

- ➜ Review session 3
- ➜ Fully charge all engines
- ➜ Gather supplies for each group:
  - Train box with engine, tracks, snaps, command sheet (leave out wagon)
  - Session printout
  - Pencil, eraser
  - Pair of scissors
  - Scotch tape

Tips

Split track pieces: We need two split track pieces, one male and one female (one has a notch at one end and the other on the other ends). Make sure students pick one of each!

Direction: As in the last session, the direction the engine travels in is important. Make sure students remember that the direction is indicated by the yellow arrow.

Tally marks: Kindergarteners and 1st graders may not know what those are and need an example. You could certainly do the first tally marks together in class and then students complete the rest themselves.

Randomness: It's up to you if you want to introduce the term "random", but students should come to the conclusion that, without snaps, sometimes the train goes one way and sometimes the other. This means that at a given time, they cannot predict which way the train will go at the next split.

Adventure: The first step is to remove all snaps from the track. Make sure they don't skip this!

Hints younger students: We display which color to use for which action stop to let younger kids focus on the exact placement of the snaps onto the track.

Reflection

How can you make sure Jamy goes the right way?

We want them to realize that by using snaps at a split, Jamy goes the same direction every time and doesn't choose the direction randomly anymore. Note that adding a greed snap will make Jamy go straight. Adding another snap of the second snap color (red or blue depending on a right or left turn) will make Jamy turn.

Was there anything that was difficult about using snaps? What did you do about it?

This is an open question to discuss what students may have had problems with. For example, they may mention that it was important to remember the direction of the train when putting the snap commands onto the track.

Instruction Guide

Session 4: Wagons

Learning Outcomes: In this final snap training session, students learn how to drive with, and drop off the wagon. They also learn about magnets, the technology that makes this work.

Session Time: 45 min

Prepare

- ➜ Review session 4
- ➜ Fully charge all engines
- ➜ Gather supplies for each group:
  - Train box with engine, wagon, tracks, snaps, command sheet
  - Session printout
  - Pencil, eraser
  - Pair of scissors
  - Scotch tape

Tips

Wagon: It's essential that the arrow on the roof of the wagon points to the engine. If not, the wagon will not be dropped off!

Direction: As in the last session, the direction the engine travels in is important. Make sure students remember that the direction is indicated by the yellow arrow.

Adventure: The first step is to remove all snaps from the track. Make sure they don't skip this!

Hints for younger students: The schedule for the adventure has several items and this may be a challenge for younger kids. This is why we added help steps to guide them through the task.

Reflection

Why is it important which way the wagon is attached?

They should have learned that the wagon will not be dropped off when it's attached the wrong way. You may want to explain at this point, why that is the case. The magnet in the back of the engine is actually not just a regular magnet, but a smart electromagnet. In its regular state, magnets of both polarities can be attached (that's why the wagon fits both ways). But, to drop off the wagon, the electromagnet switches to north/negative polarity and that's why it is pushing the wagon off when the north/negative magnet of the wagon was pointing to the engine.

Do you know any other objects that have magnets?

Students may come up with many clever answers like other train systems, white/magnet boards, fridge magnets, etc…

STEM Extensions

➜ **Science: Magnets.** Use the train's electromagnet and magnets as an entrypoint to study magnetic forces. (NGSS 3-PS2-3, 3-PS2-4)