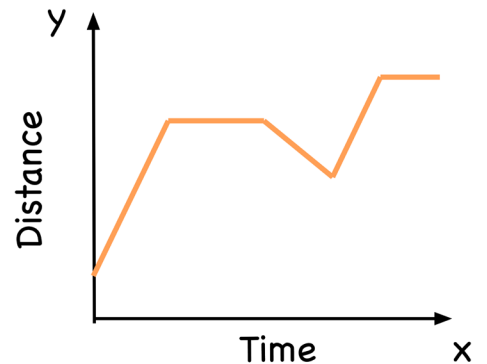


## Activity: Telling and Graphing Stories

### Introduction:

The concept of velocity and the reading of distance-time graphs is known to be difficult for students of all levels. Even college students confuse graphs such as these, which show speed, thinking that they show someone walking up and down a hill:

Such misinterpretations come from looking at the graph as a picture instead of seeing the line on a graph as a representation of a relationship between distance and time. This activity gives students the space to counter this misconception and learn deeply through physically experiencing distance and time. We asked different groups of students to nominate a “graph walker” and each group tried to follow the line of the graph. It was an amazing activity as each group improved on the last group. We used this as an opportunity to give students the message that sometimes we just need to try out ideas and see what happens because we can all learn from them. We wanted students to see how their ideas of walking the graph influenced each other to develop group understanding of a really challenging mathematical idea.



We approached this concept in two ways; giving students the experience of walking the graph and writing descriptions of graphs. The activities are named: Walking the Graph and Graph Storytelling. We have included a description of what we did during each activity; an agenda with estimated timing, our power-point slides, and directions to set up the TI-Motion Detector.

### Activity: Walking the Graph

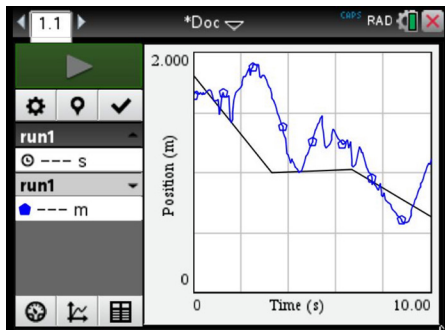
Before class we set up the TI-Motion Detector using a laptop in front of the classroom so that all students could see the graph and there was enough space for students to move around when trying to create the graph by walking or jumping (yes, they will try this too!) See the [instructions](#) from Texas Instruments about how to set up the motion detector. The equipment was placed in the room so the student walking could see the laptop screen and the class could see the graph on the projector screen.

To get started, we projected the distance-time graph for the class to see and I asked students to share ideas with their team about how to “walk” the line. We told them that each group would have a turn to try and walk the graph, with the aim of matching the graph on the screen.

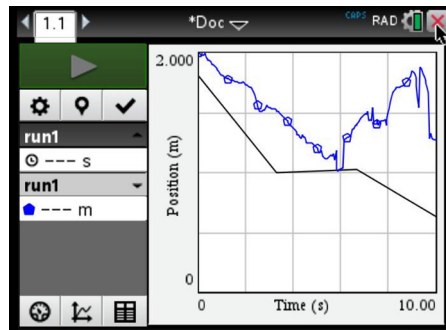
Jo randomly chose a student from each team to walk the graph in front of the class with the help of their team. When choosing individuals from a group randomly we think it helps to send the message that the person walking the graph is a representative of the team and it is the team’s responsibility to support that person. In this instance the team would support the representative by giving them directions about how to move to create the graph.

It is good to ask students to try walking the graphs with very little time to ask questions first, we did this because we wanted students to see and experience the concept, physically. The motion detector allowed students to see their attempt against the original graph.

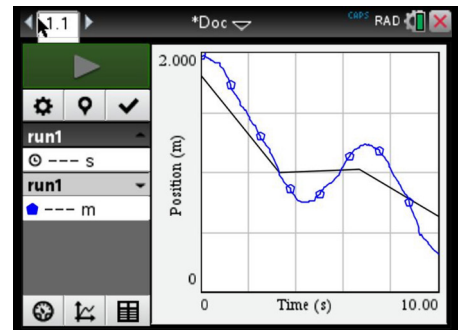
Choose a group to go first, have the first person walk with directions from their group. Then move through the remaining groups. There is no need to prompt students to discuss what a group achieved. I moved them from group to group quickly to support the learning message that it is good to fail and improve, because failures help us learn how to change and to understand the mathematics more deeply. You can see in the slides pictured below how the graphs became more accurate with each groups' turn.



Group 1



Group 2



Group 3

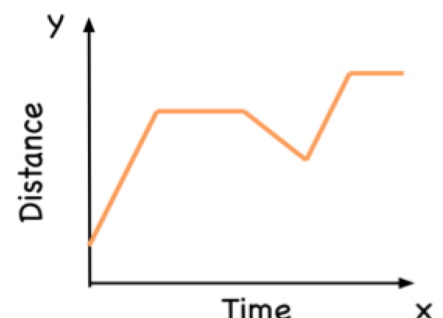
Once each group had walked once, Jo shared her message about learning, that you can see [here](#). We wanted to let students know that trying things out and then failing is how learning happens and it is not important to be a "perfectionist"; it is good to try and fail and to just "give it a go".

After sharing the learning message, we asked all the teams to "walk the graph" again.

## Activity: Graph Storytelling

A common misconception among students when interpreting distance-time graphs is the idea that the line represents someone walking up and down a hill. We wanted to make sure we discussed this so we brought the idea of walking up a hill into the conversation by offering it as another student's idea from another class. We used the slide below so students would be confronted with this thinking about describing distance-time graph.

After giving students time to write individually, we asked them to share ideas with their group before we started a whole class conversation about what students would say to Sam about his ideas.



Sam, in a different class wrote "they went up a hill, then they walked on flat ground, then they walked down a hill, then back up, then they walked on flat again" Write a note to Sam saying what you think is wrong about his thinking."

During the whole class conversation we wanted students to really understand that to walk the graph they should be thinking about how to move towards and away from the motion detector at different rates. We started the conversation by asking the students what they discussed in their groups, this gave space for more students to share.

As a way to deepen understanding and encourage students to be attentive to the story being told by the graph and the changing of variables, groups looked at heart rate and time, and height of water with time. We then discussed each graph by starting with group discussions and moving to whole class discussions.

As an extension, we asked teams to make their own graphs and sketch them on poster paper and then trade with another team who were asked to describe the story the graph was telling.

### Agenda for the activity:

Activity	Time	Description/Prompt	Materials
Walking the Graph	20 min	<ol style="list-style-type: none"> <li>1. Ask students to study the distance-time graphs in teams; discuss how to walk to create the shape of the pictured graph.</li> <li>2. One person from each team takes turns walking the graph following direction by the team.</li> </ol>	Laptop TI Smartview Software LCD projector CBR 2TM & Cable Vernier® EasyData™App
	5 min	Message About Learning	
	10 min	Have another person from each team walk a different distance-time graph.	
Graph Storytelling	40 min	<ol style="list-style-type: none"> <li>1. Ask students to write a response to Sam’s description of walking up hill to create the line on a distance-time graph.</li> <li>2. As a class discuss Sam’s description of how to walk distance-time graphs.</li> <li>3. Move to telling stories about graphs with different dependent variables over time.</li> </ol>	Laptop LCD projector Pencil Paper/journal
Closing	5 min	Ask students to write about one new thing that was challenging about the day.	

### Extension:

Ask teams to make a poster with a sketch of a graph relating any variable to time. Then ask them to give their poster to another team to describe the story that corresponds with the graph and record it on the poster.