

# Unit 5

## KNOWLEDGE

### Facts

### Skills

- Temperature is the measure of the average motion of atoms and heat is the actual motion
- Accuracy is the proximity of measurement results to the true value while precision quantifies the reliability of a measurement.
- Heat can be transferred through conduction, convection, or radiation.
- Heat conduction is material dependent.
- A linear regression can be done to determine the mathematical relationship between two variables.

- Cutting and stripping wires
- Measuring and cutting wires
- Troubleshooting circuits
- Debug programs
- Isolate or reduce experiment variables to increase precision and accuracy

## GOALS

Students will understand heat as a form of energy transfer.

Students explore methods of heat transfer.

Students will convert sensor outputs in ADUs to meaningful quantities by deriving the linear relationship between ADU and degrees Celsius.

Students will begin creating plots in jLogo and exploring mean, median, mode, and linear regressions.

Experiments:  
 1) Getting Warm  
 2) Temperature Calibration  
 3) Soil Temperature - depth and color

## BIG IDEAS

### Concepts

### Processes

Science: Energy transfer rates depend on the atomic structure of materials in contact

Computing: Analog signals are continuous functions while digital signals are discrete functions.

Computing: Analog sensor readings are converted to digital values using a mathematical relationship. The equation of this relationship can be derived using a linear regression.

Successfully perform a linear regression on sample datasets by hand

Write a program to perform a linear regression on sample datasets

Graph datasets using jLogo

Perform statistical analysis on datasets using jLogo

Write jLogo words to convert voltage to degrees Celsius

## MEANING

### Generalization

### Understanding

Students will recognize the importance of "units" when reporting measurements

Students will recognize that any measurement includes uncertainty

Students will relate concepts of heat transfer to ecosystems and weather

Students will reflect on real-world examples of analog and digital information

Students will read about boreholes and recognize connections between that topic and their soil temperature experiments.