Improving our Classroom Environment v3

Internet of Things: CfE Science 2nd Level

Teachers' Lesson Guide

THE UNIVERSITY of EDINBURGH

Data-Driven Innovation

CITY REGION DEAL
Edinburgh & South East Scotland

Schools IoT

Improving our Classroom Environment

Synopsis

- This topic helps learners to understand how sensors can be used to gather information about building environments, such as the level of CO_2, as well as temperature, humidity and light levels.
- Learners investigate how these environmental factors can impact learning. They research and discuss how, at certain levels, environmental variables such as CO_2 can have a detrimental effect on the capacity to learn.
- Learners will use the PPDAC process to identify problems, plan solutions, gather and analyse data, and draw conclusions.
- Learners plan and carry out experiments to measure the impact of changes to their classroom environment, for example how the introduction of plants reduces the level of CO_2 and the subsequent impact that this has on their learning.
- Central to this topic is the use of sensors for gathering data about building environments. Learners will have access to an Elsys ERS Smart Building Sensor which measures levels of CO_2, temperature, humidity and light in their classroom over time.
- Learners read and analyse data gathered by the sensor to provide information about their learning environment. During this longitudinal study, learners will correlate changes in environmental variables (eg, light, CO_2 and temperature) with their readiness and capacity to learn.
- Learners may extend their learning about classroom environments and apply it to other contexts, such as offices and homes.
- Some classes may wish to connect with other schools carrying out similar research – details of participating schools can be provided by the Data Education Team at the University of Edinburgh.
- Through their involvement in this project, learners will develop an understanding of how sensors contribute to the Internet of Things (IoT) - the system of interrelated computing devices, mechanical and digital machines, which transfer data over a network without requiring human intervention.

Duration

This is a longitudinal study which requires ongoing gathering and analysis of classroom environmental data.

While the class may choose to determine the length of the period of research, 12 weeks is the recommended minimum period for the investigation, in order for learners to be able to gather robust data for analysis and evaluation. Some classes may engage in extension activities which will extend the length of the project.

Time should be set aside on a weekly basis for revisiting the investigation and analysis of sensor data. Their classroom data is presented via a digital dashboard curated by the University of Edinburgh.

At the end of the investigation period, time should be available for learners to draw conclusions, discuss of the impact of their findings and share their learning.

Objectives

- ✓ To develop scientific inquiry and investigative skills.
- ✓ To introduce learners to concepts about data and its use in problem solving.
- ✓ To raise awareness of how sensors are used to gather data in the environment.
- ✓ To analyse, interpret, evaluate and present scientific findings.

Age and stage

- CfE second level
- Coverage of CfE experiences and outcomes, science benchmarks & skills development, and IDL links are shown below.

Curriculum areas/benchmarks

Second Level Science Skill

- Selects appropriate methods to record data/information.
- Identifies relationships between the independent and dependent variables.
- Relates findings to the wider world.
- Draws basic conclusions consistent with findings.
- Identifies and discusses additional knowledge and understanding gained.

Second Level Topical Science (various)

Digital Learning

- I can select and use digital technologies to access, select relevant information. TCH 02-02a

Maths/Numeracy

- I have carried out investigations and surveys, devising and using a variety of methods to gather information and have worked with others to collate, organise and communicate the results in an appropriate way. MNU 2-20b
- I can display data using a suitable scale, by choosing appropriately from an extended range of tables, charts, diagrams and graphs, making effective use of technology. MTH 2-21b

Literacy

- As I listen or watch, I can make notes, organise these under suitable headings and use these to understand ideas and information and create new texts LIT 2-15a

Knowledge, Understanding and Skills

- Know that sensors can be used to gather data on environmental entities.
- Understand how sensor data could be used to solve a problem.
- Analyse, interpret and evaluate scientific/numeric findings.
- Present scientific findings.

Resources

Resources to support this activity are highlighted in the lesson plans. This includes PowerPoint presentations, learner instructions, data observation sheets and activity templates. An Elsys ERS Smart Building Sensor is used to measure levels of CO_2, temperature, humidity and light in the classroom, along with instructions for installation and operating.

Lesson Planning

Activity Overview

Activity 1	The Class that Kept Falling Asleep
Activity 2	Investigating environmental factors
Activity 3	Introduction to sensors and data about buildings
Activity 4	Investigating our learning environment
Activity 5	Recording 'Learning State' evaluations
Activity 6	Analysing the dashboard
Activity 7	Changing our learning environment
Activity 8	Can plants improve our learning environment?
Activity 9	Drawing conclusions from the investigation
Activity 10	Making a presentation
Activity 11	Extension work

Learning intentions (covering the entire project)

- We are finding out how CO_2, temperature, humidity and light affects our learning.
- We are learning about how sensors can capture environmental data about buildings.
- We are exploring ways of improving our learning environment so that we become more successful learners.

Success Criteria (covering the entire project)

We will know if we have achieved our goal if I can:

- Identify problems caused by a poor classroom environment.

- Understand how sensors collect data about buildings.
- Analyse data arising from our investigation.
- Suggest how we can improve our learning environment using sensors to help us.
- Follow instructions and work well in a group.

Assessment

- Observation of learner engagement during learning activities and understanding of background science.
- Questioning during the plenary and presentations.

Resources

- PowerPoint – Activities 1 to 10
- Building sensor
- Sensor data from Cladach Primary (Activity 3)
- Templates for rating Ready to Learn?