Edinburgh and South East Scotland City Region Deal Joint Committee

10am, Friday 1 March 2024

Data Driven Innovation - Internet of Things in Schools Project Update

Item number 6.3

Executive Summary

This report updates on progress made by the Data Driven Innovation (DDI) Internet of Things (IoT) in Schools project. A presentation was previously provided to the Joint Committee on 3 December 2021 and a video showcasing examples such as work at Addiewell Primary school was included in the ESES City Region Deal Annual Report 22-23.

The project aims to deliver the IoT in Schools service to the majority of schools across the ESES City Region.

The IoT in Schools service provides schools with environmental sensors, which may include the measurement of CO2, light levels, humidity, and temperature, as well as access to data visualisation web pages showing data from each sensor, lesson guides and other support materials. Learners can explore the data from internal and external environmental sensors, developing their skills in data, numeracy, technology, and science. This will improve digital and data literacy, empowering learners to succeed in a data driven future.

Deployment of the IoT in Schools service has completed to all West Lothian primary and secondary schools. Pilot projects are in progress at all other ESES City Region Local Authorities, and initial planning for wider deployments will be underway shortly.

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Report

Data Driven Innovation – Internet of Things in Schools Project Update

1. Recommendations

1.1 To note the progress made by the IoT in Schools project to complete the rollout of the service to all primary and secondary schools in West Lothian, and establishing pilot projects across all other authorities.

1.2 To acknowledge the great effort made by students, teachers, support teams, and other local authority staff across all ESES City Region Local Authorities to progress the project to this stage.

1.3 To note that planning is commencing for wider rollouts across Fife, the Scottish Borders, East Lothian, Midlothian, and the City of Edinburgh following the completion of their respective pilot projects.

1.4 To note that a further progress report to be presented in six months.

1.5 Members are encouraged to view the three case study videos from pilot projects, which are on the IoT in Schools website. These demonstrate the benefits that the IoT in Schools service will bring to schools across the ESES City Region Deal area.

2. Background

2.1 The IoT in Schools project is part of the wider IoT Programme within the Data Driven Innovation (DDI) Programme.

2.2 The IoT in Schools project is working closely with the Data Education in Schools (DES) Programme, which is part of the Data Skills Gateway element of the Integrated Regional Employability & Skills (IRES) Programme.

2.3 The aim of the project is to provide the IoT in Schools service to the majority of schools across the ESES City Region area. **The service will be a significant factor in supporting the DES programme to meet its aim to improve digital and data literacy, empowering learners to succeed in a data driven future.**

2.4 The IoT in Schools service consists of the following:

- A Memorandum of Agreement in place between the University of Edinburgh, and each Local Authority separately.

- Each school will have:
    - A connection to the University of Edinburgh and the DDI IoT networks.
    - Several environmental sensors to be located within the school. All schools will have sensors that will monitor CO2, temperature, humidity, and light levels. Some schools may have sensors to monitor soil temperature and moisture, and air quality in outdoor spaces, and some may monitor school wormeries or bee hives.
    - Access to data visualisation web pages, showing data from each sensor, on the IoT in Schools website.
    - In-person professional learning sessions on data literacy and sensor technology for groups of teachers. For teachers not able to attend an in-person session, an introduction video has been produced.

3. Main report

3.1 There are over 500 potential target schools across the ESES City Region area. Actual target schools will be agreed with each ESES City Region local authority.

3.2 Deployment of the IoT in Schools service has completed to all West Lothian primary and secondary schools.

3.3 Pilot projects are starting up or are underway in all other ESES City Region Local Authorities.

3.4 The pilot projects so far have demonstrated that the learners have a great interest in data when they can experience its use in a real-world context. Through the IoT lessons, pupils have developed data, digital, numeracy, science and language skills, and a thirst to know more. There have been some notable examples:

3.4.1 **Addiewell primary and the alligators**:
In a fascinating experiment conducted by a group of school children in Addiewell Primary School, the IoT project team worked with Five Sister Zoo in West Lothian to install environmental sensors in the alligator enclosure. Data visualisations for these sensors were provided alongside those for the sensors in the school. The learners were thrilled to be able to compare their classroom environment to that in the crocodile enclosure. They were amazed at the stark differences they found and they gained a new perspective on the importance of environmental factors.

3.4.2 Roslin Primary and the underwater volcano:
The pilot project in Roslin Primary School included the test of an outdoor air quality monitor in the school grounds. A P5 class were surprised when they saw a blip had appeared on their atmospheric pressure graph. With the help of their teacher and a contact in University of Edinburgh, the learners discovered that this blip was caused by the pressure wave from an underwater volcano eruption near Tonga. They investigated more about volcanoes, eruptions, and pressure waves. They confirmed that given the distance from Tonga to West Lothian, and

the speed of the pressure wave, the blip on their graph matched the exact time that a pressure wave from Tonga would have reached their school. Through the University of Edinburgh, the learners were able to present and discuss their findings, and ask further questions, via a video call with a volcanologist who was studying volcanoes in Ecuador at the time.

3.4.3 Cramond Primary and the class that fell asleep:
The learners in Cramond Primary School took several weeks to investigate their environment, focussing on temperature, humidity, CO2, and light. They were introduced to the PPDAC (Problem, Planning, Data, Analysis, Conclusions) protocol, which helped them come to conclusions about their environment and propose solutions to improve it. The learners enjoyed the real-world context of the lessons. They investigated the effect CO_2 can have in a classroom and could see a daily pattern in the CO_2 levels in their classroom, and how changes such as opening the classroom door would cause CO_2 levels to drop.

3.6 The next steps for the project are:

- The project team will meet with Local Authority teams to review pilot projects and develop plans for the wider deployments. It is anticipated that the key activities/milestones for these plans will be:
  - Ensure pilots are progressing as expected.
  - Agree review date for pilots, carry out that review, and confirm that the team will move forward with the wider rollout.
  - Sign off a Memorandum of Agreement (one per local authority).
  - Agree a schedule for the wider deployment.
  - Carry out the wider deployment and confirm completion.

3.7 The IoT in Schools service is funded by DDI and is provided at no cost to the local authorities. However, local authorities may have some costs relating to the installation and set-up of the IoT gateway(s) on their networks in the schools.

3.8 The service is currently scheduled to be provided through to July 2028. A review will be held 12 months earlier to consider if, and how, the service may continue beyond that date.

4. Financial impact

4.1 There are no specific financial implications resulting from this report.

4.2 The IoT in Schools service rollout and on-going provision is free of charge until the service end date of July 2028. This includes the provision of IoT gateway and sensor hardware, provision of, and access to, sensor data visualisations, teaching and other support materials. However, councils may have some costs relating to the installation and set-up of the IoT gateway(s) on their networks in the schools.

4.3 If, and how, the service might continue beyond the current duration will be reviewed 12 months prior to the service end date of July 2028.

5. Alignment with Sustainable, Inclusive Growth Ambitions

5.1 The hands-on access to sensor-based real-time environmental monitoring that the IoT in Schools service provides to school learners, supports data literacy and engagement in the issues and factors for a sustainable environment.

6. Background reading/external references

6.1 The IoT in Schools website: https://www.ed.ac.uk/information-services/iot/learn-iot

6.2 Links to key areas on the website:

6.2.1 Intro video to the IoT in Schools service: https://www.ed.ac.uk/information-services/iot/learn-iot/iot-in-schools-project

6.2.2 Case studies from pilot schools (including three case study videos): https://www.ed.ac.uk/information-services/iot/learn-iot/pilot-studies

6.2.3 The DES (Data Education in Schools) page on the IoT in Schools site, which includes a link to the wider DES programme site: https://www.ed.ac.uk/information-services/iot/learn-iot/data-education-in-schools

6.3 Recent media exposure:

6.3.1 STV: https://news.stv.tv/east-central/west-lothian-pupils-compare-classroom-conditions-to-crocodile-enclosure-in-data-driven-project

6.3.2 Glasgow Herald: https://www.heraldscotland.com/news/23839740.addiewell-primary-works-edinburgh-uni-internet-things/

7. Appendices

7.1 None