

PRESS RELEASE

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50,000 STUDENTS IN NATIONAL SCIENCE EXPERIMENT COLLECT DATA WITH INTERNET-OF-THINGS (IOT) DEVICES AND DEVELOP DATA SCIENCE INSIGHTS

Data collected from students who participated in the National Science Experiment (NSE) found that primary school students walked more steps than their secondary school peers, and that post-secondary students (JC, polytechnic and ITE) walked the least number of steps. This is one set of data insights uncovered from the second edition of NSE, organised by the National Research Foundation (NRF) Singapore to excite young people about STEM, the scientific inquiry process and the possibilities of a digitalised, data-rich world, by getting them to be collectively involved in conducting real-life experiments using data collected with Internet-of-Things (IOT) devices.

National Science Experiment 2016

2 NSE 2016, held from April to July 2016, saw close to 20,000 students from ITEs and polytechnics participating in the NSE for the first time. Together with students from primary schools, secondary schools and junior colleges, close to 50,000 students from 92 schools and institutions took part in NSE 2016. In this mass activity, students carried the SENSg device¹ over four days to collect data on movement, temperature, humidity, pressure, light and noise levels from the environment. The data collected allowed students to derive insights on the travel patterns and lifestyle of young people.

3 Data insights derived from data collected by NSE 2016 showed that:

- Primary school students logged an average of 5,250 steps each day on the SENSg device. Secondary school students logged an average of 3,817 steps each day. JC/Polytechnic/ITE students logged an average of 2,562 steps each day.
- Bus was the most common form of transportation for students, followed by walking, car and MRT. Post-secondary students were more likely to use MRT as their main mode of transportation. A large proportion of primary school students walk and use the bus for going to school, with around 20% using the car as their main mode of transportation.
- If all car trips made by students in 2016 were replaced by public transport trips, carbon dioxide emission from all trips made by students would reduce by 40%.
- The average air conditioner usage time of a student was 8.8 hours per day. The average amount of carbon dioxide produced through the use of air conditioner per student per day was 4.7 kilogrammes. This is similar to the amount of carbon dioxide emitted when driving from Pasir Ris MRT to Jurong East MRT.
- Over 550,000 new access points were detected during NSE 2016. In total, 2.35 million unique Wi-Fi access points were detected during NSE in 2015 and 2016. This shows that Singapore is becoming increasingly well-connected digitally.

¹ The SENSg (pronounced "SENSE-SG") device is a compact, portable and multi-parameter "Lab on a Lanyard". It uses Wi-Fi to triangulate its location, and periodically uploads data to a secured database if it is in range of a known Wi-Fi access point. The data is anonymous and stored securely in the cloud.

4 The aggregated and anonymised data sets collected from NSE will also be used to support other ongoing national projects such as Virtual Singapore, the Land and Liveability National Innovation Challenge, and the Smart Nation initiative.

Big Data Challenge

5 A new competition component, the Big Data Challenge, was incorporated into NSE 2016 for students to use data science tools to come up with innovative applications of data collected during the NSE. The competition connects students with data scientists from A*STAR's Institute of High Performance Computing (IHPC) and the Singapore University of Technology and Design (SUTD) to come up with innovative applications of the data collected during the NSE.

6 As part of the competition, students participated in preparatory workshops on data science using ModStore, a large-scale collaborative data science model building platform developed by IHPC. The process exposed students to Big Data Analytics including big data processing, use of analytical tools, developing and testing hypotheses to draw meaningful insights from the data collected, and presenting the analyses in simple data visualisations.

7 Eleven teams of students were shortlisted as finalists from over 50 teams across two categories – one for secondary school students, and one for junior college, polytechnic and ITE students. See **Annex** for details of the finalists' projects.

Results of NSE 2016 and Big Data Challenge

8 Data insights from NSE 2016 was shared at the NSE 2016 Big Data Challenge Finale on 23 January 2017. Guest-of-Honour Mr Teo Chee Hean, Deputy Prime Minister and Coordinating Minister for National Security, and Chairman of National Research Foundation (NRF), Prime Minister's Office, Singapore, presented awards to winners of the Big Data Challenge.

9 The NSE is organised by NRF, in partnership with the Ministry of Education, SUTD, Science Centre Singapore, A*STAR, Singapore Land Authority and OneMap Singapore.

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**National Science Experiment 2016
Big Data Challenge Finalists**

Secondary School Category	
1.	<p>East View Secondary School: Benedine Tay Hui Qing, Huang Chao Hung, Jarry Goh Yu Xian and Natasha Lydia Selvan</p> <p>The team aimed to find out whether students are living a healthy lifestyle. They analysed data such as the number of sleeping hours and number of steps the students took each day to look at their activity level. They hope to provide solutions to help students lead a healthy lifestyle.</p>
2.	<p>Maris Stella High School Ariel Ang En Ren, Gavin Goh Jun Chong, Perry Lim Xi, Tan Hsien Wen</p> <p>The team studied the various factors contributing to stress such as travelling time, mode of transport, sleeping time, and inactive hours in a day. The happy button may also be useful in measuring stress. Although stress is not a quantifiable term and may be subjective, it often leaves students unhappy and unset, which may negatively affect the students' lives in many ways.</p>
3.	<p>Maris Stella High School: Chan Dar Shyang, Edan Koh Huai, Gan Jia Jian, Teo Hao Zhi</p> <p>The team aimed to help reduce carbon dioxide by studying different factors including distance from home to school, mode of transport and sleep, and correlated these factors to carbon emissions. This could help to provide solutions for government agencies such as the Land Transport Authority.</p>
4.	<p>NUS High School of Mathematics and Science: Ong Yong Chein, Owen Leong Song Zhu, Saravanan Yukesh Ragavendar, Tay Kai Jun</p> <p>The team aimed to examine the lifestyles of a group of NUS High students who participated in the National Science Experiment. Using data collected from the SENSg device, they debunked some myths about the school, promoted some of the strong points of their school outside the academic realm, and provided some advice to the school board to help improve the school experience for students. Various analyses on movement of students, sleep patterns and study time were also discussed.</p>
5.	<p>Swiss Cottage Secondary School: Ang Bin Heng, Chen Jun Hua, Jaron Lim Kiat Sen, Rachel Tan Xuan Qi</p> <p>The team focused on the stress level of students, which is a common issue faced by students as they find that the time given for them to rest and relax is insufficient due to the high demand from the academic system. They aimed to link to sub-factors such as schooling hours and sleep duration to the stress level of students.</p>

Junior College / Polytechnic / ITE Category	
6.	<p>ITE College West: Adam Muhammad Harith B Zakba, Hanaffie B Bakri, Mohammad Fitri B Mohd Ridwi, Muhammad Faruq Bin Jumadi</p> <p>The team looked at students' movement behaviour in two main areas: general movement converging towards ITE College West and bus travelling behaviour. MySQL and Python pandas were the main tools used to analyse and generate data. The students cleaned up irrelevant raw data, extracted bus stop location information from LTA Data Mall, and analysed bus stop information and existing data from the NSE ModStore.</p>
7.	<p>ITE College West: Christine Koh Zhan Wah, Lim Zi Xiang, Neo Zhen Cheng, Yap Jun Lin</p> <p>The team analysed the happy moments captured when students pressed a button of the SENSg device at various times and locations. This allowed them to understand when and where students are happy, and the activities that students engage in that make them happy. This allowed them to engage students more effectively and create a suitable learning environment for students.</p>
8.	<p>Ngee Ann Polytechnic: Aaron Sng Li Wen, Pang Biao Yi, Soon Qing Rong, Wong Wen Kang</p> <p>The team compared the lifestyles of students from different schools in the polytechnic by looking at the number of stairs climbed, the number of steps taken, and the time spent outdoors. They found that the School of Life Sciences and Chemical Technology is the most active school while engineering faculties tend to be the least active. The team also concluded that the students' level of activity is related to the usage of electronics and the choice of transportation mode.</p>
9.	<p>Nanyang Polytechnic: Andre Ang Peng Ren, Ngo Wei An, Noel Sung Tze Xuan, Tan Zhen Wen</p> <p>The team analysed the vertical travelling patterns of students. As Singapore moves towards being an inclusive society, there will be more students with disabilities studying and moving around the campus. Understanding the vertical travelling patterns will help the school to plan timetables that are more conducive to students with disabilities, to help them focus on their lessons.</p>
10.	<p>Nanyang Polytechnic: Darrell Ong Zheng Dao, Jesslyn Chang, Lim Dao Yong, Mohamed Izzat Khair Bin Mohamed Noor</p> <p>The team aimed to determine the optional time for school to start, suggested ways to reduce congestion (and hence decrease the number of latecomers), and provided suggestions to students on possible routes to take to go to school.</p>
11.	<p>Singapore Polytechnic: Bryan Cheong Teng Yue, Bryston Chang Wa Jie, James Pang Jun Jie, Paing Khantt Lin</p> <p>The team focused on finding possible reasons why Singapore Polytechnic students are happy. They also looked at students' level of physical activity (e.g. number of stairs climbed per day, time spent outdoors, etc) to see if there was any correlation to their level of happiness. The team also looked at students' carbon footprint from transport and air-con usage over a five-day period, and suggested ways that students can help to reduce this amount.</p>