ACTIVE8 ROBOTS

Technology at Etone

Creating an interactive learning environment for students has always been a key strategy for teaching and learning at Etone College and we are constantly on the lookout for innovative ways to inspire our students. Enter the robots!

Over the last two years we have been introducing Robotics to our curriculum. This has been supported through a number of initiatives, including the introduction of our LEGO Education Innovation Studio (LEIS). The LEGO Education resources in the LEIS have made a significant contribution to modernising the curriculum and making learning more relevant to our students.

We are constantly striving at Etone to keep our curriculum relevant, aiming to equip students with skills that provide the foundations for economic success. To achieve this we have formed links with local industrial organisations that operate or manufacture robotics (such as 3M, MIRA Ltd, Hammonds Ltd and Autowash Engineering Ltd). Here students have been given the opportunity to experience the industrial application of robotics, work with experts and enquire about the contribution that automation and robotics makes to our local and national economy. For example, when working with the Motor Industry Research Association (MIRA Ltd.) the students worked closely with MIRA Engineers on a military applications using LEGO Mindstorms as programmable robots to create Unmanned Ground Vehicles (UGV'S) that simulated the process of detecting landmines. Whilst the project focus was predominately on autonomous vehicles, it embraced the Spiritual, Moral, Social and Cultural (SMSC) aspects of robotics and created much debate over the questions "What is a robot?" and "What does the future of robots look like?"

The answer is an ambiguous one, but having been given the opportunity to trial the next generation of robotics in education, the future is likely to be in the form of humanoids. NAO is a humanoid that provides a completely different robotic experience; one that amazes both staff and students.

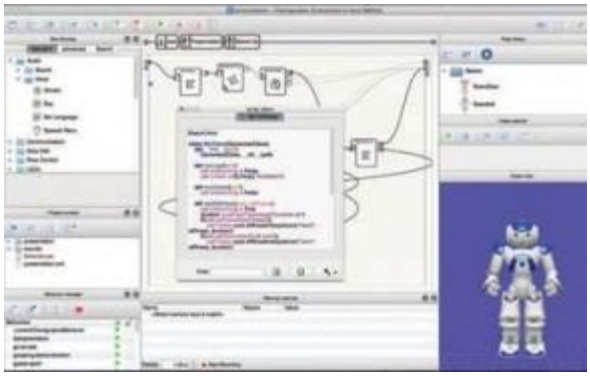
I attended a full day training session with a number of other teachers in Warwick. We were introduced to NAO and there was huge excitement. It's always fantastic to see teachers excited; it is a huge indicator as to what the impact would be in any classroom! The fun and challenging training was delivered by John Pinkney from the Warwickshire ICT Development Service, and was focused on the educational use of NAO. The buzz of learning lasted throughout the day and I could not wait to get NAO into my classroom!

NAO walked into my classroom at 580mm, with 21 motors, eight force-sensing resistors, two colour changing LED eyes, two speakers, four microphones, two HD cameras on its head and a host of sensors. As a fully programmable humanoid, students can express their creativity and understanding in a fun and interactive way whilst applying and evaluating their understanding of key engineering principles. NAO is a technological work of art. Even as an inanimate object, he gets total attention. Then programming brings him to life…

## PROGRAMMING NAO

NAO comes with easy to use and flexible programming software – Choregraphe. In its simplest form, it is a drag and drop flowchart style of programming which students find intuitive, whilst more complex programming language can be achieved using C++ or Python.

A key benefit of the software is the ability for students to connect to a virtual NAO. The virtual NAO appears on the screen and allows the students to simulate the program before wirelessly uploading to the NAO robot itself. This allows the students to understand the capabilities of NAO and develop their programming skills in a safe and controlled manner.



The application of physics, electronics, and mathematical theorems can be drawn out of even the most basic of programs. Indeed, one of the most impressive features of the NAO is its ability to stand up (unassisted) from a horizontal (lying down) position, demonstrating phenomenal balancing capabilities which epitomises the consolidation of Science, Technology, Engineering and Maths (STEM).

The Choregraphe software is great at allowing students to develop their problem solving and collaborative skills. NAO also has a range of graded programming exercises that students from which students can develop their programming skills – providing a great foundation from which further extend their learning.

## NAO AND THE CURRICULUM

NAO offers many opportunities within the new National Curriculum where students are tasked to 'investigate new and emerging technologies'. The study of the physical robot itself is a great basis to get the students to 'understand and use the properties of materials and the performance of structural elements to achieve functioning solutions' and indeed develop their application of 'computing' and looking at 'products that respond to inputs [for example, sensors], and control outputs [for example, actuators], using programmable components [for example, microcontrollers]'. The more that we have used NAO, the more opportunities have come to light – indeed students themselves have actually highlighted many of these through their creative outcomes!

NAO obviously generates huge interest across the school and with 'computing' now a developing area, he offers much to the ICT department. What a great way of getting students to see the power of programming – it really brings it to life! It also provides teachers a structured way of developing their own programming skills, which for some teachers might be a new experience. The scope of the software certainly meets the needs of ALL users.

NAO has also offered much to other areas of the school. During 'World Book Day' the students programmed NAO to read a passage from their favourite book whilst making

expressive gestures in line with the text. This combination of human likeness reaches out to students who wouldn't normally be so engaged with literature and demonstrates the wider influence that technology can have on teaching and learning. NAO is so captivating that every student becomes engaged in the learning, which transforms the nature and pace of lessons. Tasks can be differentiated through the instinctive software, which allows for students to combine more complex multi-task routines such as voice recognition, where NAO actively responds to a programmed verbal command to carry out an activity.

Our students were so impressed with the capabilities of NAO that they programmed him to promote the value of robotics within STEM education during assemblies. The audience were not only entertained but also educated on the potential prospects of following a career in robotics.

There is no doubt that NAO provides an insight into a technology that many refer to as the 'technology of tomorrow'. NAO makes a very clear statement that it is in fact the 'technology of today', and at Etone we are developing students who can embrace this head-on and take it forward into an exciting and challenging future.

## NAO AND STUDENTS

Students have really enjoyed the experience of working with NAO… "A brilliant experience!" Emilly

"Awesome robot which we were able to continue to use in STEM Club," Alex.

"Fun term with both LEGO and NAO robotics," Chloe.

"Incredible to be able to program a robot to dance to music!" Zahra.

"Best humanoid robot yet," Yusuf.

"A fantastic opportunity to work on real 21st century technology," Karis.

"A robot that talks, walks, dances, plays songs, sits up, answers questions, responds to people, plays football, WOW, I want one!" Ryan

"He acts like a real human, I think he's very clever," Kira.
"The NAO robot is out of this world!" Asif