

Serious Science with Silly Sensors

Technology Volunteers at the 2015 European Scratch Conference

IATL Collaboration Grant Final Report

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Introduction

Technology Volunteers is a dedicated group of students and staff at the University of Warwick, who volunteer their time to encourage children to become creators rather than consumers of technology. This aim is achieved through the creation and delivery of a wide range of interactive, technology-based workshops in schools throughout Coventry and Warwickshire. One of our most popular workshops revolves around the use of the Scratch programming environment, which encourages children to develop an interest in computer programming in a fun and exciting way. Since the group's formation as a Warwick Volunteers project in 2008, Technology Volunteers has grown to include more than forty active student volunteers in the 2014-15 academic year.

In July 2015, the Technology Volunteers Project Leaders were given the opportunity to present at the 2015 European Scratch conference in Amsterdam. The conference is supported by MIT, the creators of Scratch, and is attended by hundreds of delegates from around the world.



The Technology Volunteers at the 2015 European Scratch Conference with Mitch Resnick, the creator of the Scratch programming environment.

Our Sessions

During the conference, Technology Volunteers delivered a number of sessions. These provided an opportunity for us to share our experiences as student volunteers, and to gather feedback on how we can make these sessions more effective in the future. Our sessions included an Ignite presentation, an interactive workshop, and multiple poster presentations.

Ignite Presentation: NextGen Scratch Wizkids

Our Ignite presentation was a fast-paced, five-minute talk on the changes which we have encountered since starting as Technology Volunteers. It focused on the importance of adapting our work to best suit the needs of those students who are increasingly becoming more adept at programming. In 2014, Computing became part of the UK National Curriculum, meaning that the majority of our target pupils now gain experience with Scratch prior to our workshops. One of our main goals for the conference was therefore to present some of the ways in which we have adapted our workshops for these "wizkids", and to develop our workshops further by collaborating with other conference delegates. The Ignite presentation provided a perfect platform from which to start such collaborative discussions.

During the presentation, we outlined some of our most recent ideas for increasing student engagement, including new homemade sensors which interface with Scratch: a wind speed sensor and a soil moisture sensor. These sensors were designed to be simple to put together, using materials which are either readily available or inexpensive to purchase, and each helps to teach students the interaction between hardware and software. These sensors were selected as they measure tangible environmental conditions, which students can easily recognise from the physical world, helping to make this interaction as clear as possible.

Although similar homemade sensors had been used in our workshops in the past, these new sensors focused on teaching scientific concepts through Scratch. We hope that this focus will help to improve cross-curricular learning during our workshops, allowing students to conduct interesting science experiments with Scratch, such as writing software which monitors the conditions a plant is exposed to over time to learn more about Biology. These interdisciplinary resources will not only appeal to pupils in primary and secondary schools with interests outside of computing, they will also help us to encourage students reading a wider range of degrees to start volunteering as Technology Volunteers.

This presentation, which took place in the same large auditorium as the keynote speeches, allowed us to present our ideas to a significant number of delegates including educators, researchers and IT professionals. After the presentation we received lots of positive feedback, and many of the delegates were keen to find out more about these new sensors.

Our Workshop: Serious Science with Silly Sensors

Fortunately, our workshop provided an excellent opportunity for those who attended our Ignite presentation to get first-hand experience constructing and using the sensors we demonstrated, along with a wide range of new "silly sensors" designed to teach "serious science" with Scratch. Again, all of these sensors were designed to be made from everyday household materials such as cardboard and empty food containers, along with one or two inexpensive electronic components, helping to make our workshops as accessible as possible.

The workshop began with a talk on the work of Technology Volunteers, which emphasised the importance of developing students' understanding of everyday technology. The team also demonstrated the sensors that we had constructed, and shared some ideas for what activities and learning opportunities would be possible with the sensor. This was then followed by an interactive session where attendees were encouraged to get involved and experiment with creating their own homemade sensors for use within future workshops.



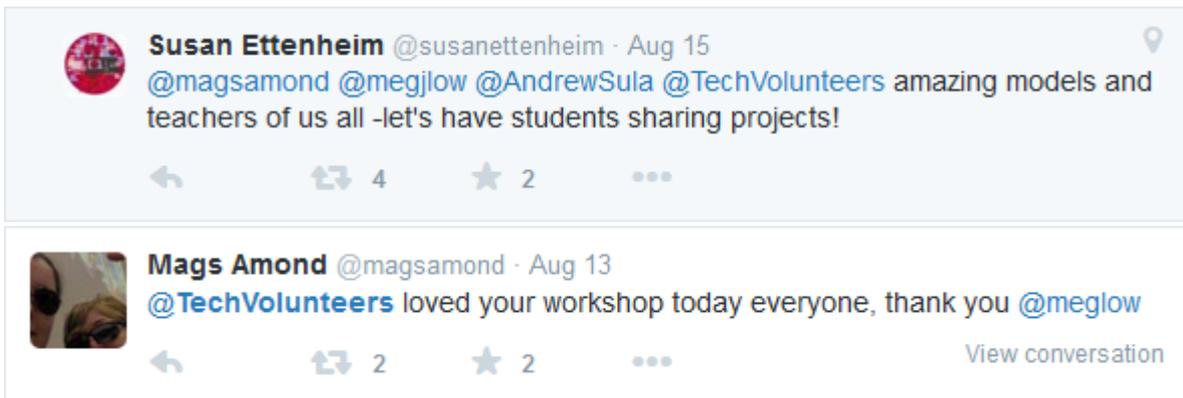
Our workshop's opening talk.

This involved handing each member of the audience a set of simple supplies including metal bottle caps, buttons, elastic bands and an array of cheap electronic components, together with the challenge to either build some of our example sensors or to design their own to explore an area of science they find particularly interesting. Members of the audience could also try out our pre-made sensors, an opportunity which generated lots of valuable feedback and lesson ideas.

At the end of the workshop we distributed a number of worksheets which we created to accompany each sensor. These worksheets outline how to assemble the sensors and connect them to Scratch, and each provides a detailed explanation of the science behind the sensor's operation. As well as providing printouts of these worksheets, we also published our resources to our "Scratch Resources" website, which has received well over 10000 unique visitors since its creation in 2012, a testament to our commitment to disseminating our work internationally



A young conference delegate experimenting with our homemade Scratch sensors.



Example tweets from some of the delegates who attended our workshop and follow our @TechVolunteers Twitter account.

Poster Presentations

In addition to the group sessions, some members of the Technology Volunteers team took part in poster presentations. Arteesha's presentation focused on her MSc project where she investigated the effectiveness of analogies as a tool to introduce Computer Science concepts to adult learners, whilst Stephen outlined his work on the use of Scratch for electronics projects in schools. These sessions required a significant amount of preparation in advance, with both Arteesha and Stephen producing detailed A1 posters explaining their projects. These presentations both went well, attracting a significant level of interest and many questions from the other conference delegates.



Arteesha and Stephen during the poster presentations.

The Effectiveness of Educational Technology for the Introduction of Computer Science Concepts to Adult Learners

Arteesha Bosamia

“The conference provided a great opportunity to showcase the application that was developed as part of the MSc project. The purpose of the project was to study how effective analogies are to introduce Computer Science concepts to adults that have an interest in learning Computer Science but find that most resources are too technically advanced or generally unsuitable for them. The application built, consisted of short videos that depicted scenarios and experiences that adults may be familiar with, yet explain Computer Science concepts within these scenarios. The application was an HTML5 app called CSLearn uploaded onto a public domain for wider distribution. The link was also distributed across Twitter with the hashtag #CSLearn. The conference attendees who saw the application were very pleased to see it as they felt it was a unique idea and has potential to be very useful to people. Many of them were teachers and had experience working in the educational industry, specifically adult education and explain why this would be useful to many users due to the difference to the current resources available.”

Scratch: Away From the Screen

Stephen Pithouse

“The poster showed the new ways in which Warwick Technology Volunteers use Scratch software in schools to encourage children to physically make projects (gaining basic electronics skills as well as programming). The feedback received was very positive. Teaching staff were interested in the role that the University Volunteers play in the local environment and also further afield. They took our contact details and links to our website resources which they aim to follow with their students.

Conference attendees even enquired about the possibility of a further workshop session on the topics so that they could try for themselves the projects shown. It was a great experience to share our work with so many keen educators.”

Benefits

The conference provided a number of excellent opportunities for Technology Volunteers, most notably the opportunity to form new relationships with international educators and technologists. Similar connections made in previous conferences grew into exciting future opportunities, such as our ongoing work with Susan Ettenheim from the Eleanor Roosevelt High School in New York since first meeting her at the 2012 Scratch conference at MIT. This fruitful collaboration with her animation classes has resulted in more resources to teach Scratch and physical sensors to school children with an interest in art and animation. We hope that some of the contacts made at this year's conference will develop into similar opportunities going forward.

Moreover, gathering feedback from the conference's international audience has allowed us to get interesting new perspectives on our resources, and how they can be adapted to suit students from a diverse range of backgrounds. These will help us to ensure that our outreach activities are as inclusive as possible. Discussions with members of the conference's audience have also sparked new ideas, which will be used to enhance our training of new volunteers, as well as the quality of the workshops we deliver in local schools which currently reach around 200-250 young people in the local area each year. The conference also provided ample opportunities for each student leader to present and network, helping the team to develop their communication and presentation skills.

Conclusion

Overall, attending the conference has been a highly enjoyable and rewarding experience. We are now looking forward to sharing what we have learned within our group, the University and the wider community. Over the 2015-16 academic year, Technology Volunteers will visit numerous conferences to disseminate our resources further: the OCR Cross Curricular Computing conference, the National Computing At School conference, the Mozilla Festival and the Imagineering Fair. We will also continue to share them online through our website and popular online communities such as ScratchEd.

Thank You

On behalf of the entire Technology Volunteers team, we would like to take this opportunity to thank IATL for financially supporting this project. Without IATL's support, we simply would not have been able to attend the conference. We would also like to thank Margaret Low, Marie Low, Robert Low and Thomas Preece for their support in both planning and delivering our workshops.

Further Reading

- **Conference Website:** <http://www.scratch2015ams.org/>

- **Official Scratch Website:** <http://scratch.mit.edu/>
- **Scratch Resources:** <http://warwick.ac.uk/scratchresources>
- **Technology Volunteers Website:** <http://warwick.ac.uk/techvolunteers>