

# **BRLSI Researchers: Enthusiastic enquirers into science, learning and life**

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## **Abstract**

This multimedia publication recounts the learning journeys of a group of teenagers and the postgraduate research students and project leaders they worked with as participants in the first Bath Royal Literary and Scientific Institution (BRLSI) Researchers Programme.

The Young BRLSI programme aims to raise aspirations and knowledge of Science, Technology, Engineering and Mathematics (STEM) research and engender an interest and confidence in young people to undertake self-directed, passion-led, co-creative and hands-on learning. In addition it offers an opportunity for students and members of the community to practice and improve their communication skills, particularly with reference to STEM.

The BRLSI Researchers project forms part of the Young BRLSI programme, and brings self-selected young people and post-graduate young people researchers together to enjoy challenging workshops that provide fun learning opportunities. The BRLSI Researchers programme came from an approach by two young people who had been to many of the Young BRLSI workshops and wanted a greater challenge to support their progress as researchers. At the same time, the University of Bath (UoB) Public Engagement Unit was seeking to facilitate high quality public engagement, embedded across links between their research and the public.

The BRLSI Researchers programme provided a context in which everyone was equally valued in their ability to provide help and support for other people to learn, as well as for taking control of their own learning. In addition to sharing and developing STEM knowledge and research skills, the intention was to encourage all participants to develop their ability to work in a team, gain confidence to organise and present their learning, recognise themselves and act as an expert knowledge-creating researcher, learn more about themselves and contribute useful knowledge to the community. In addition, the postgraduate students developed their skills as research supervisors and mentors.

All the postgraduate students were recruited from the UoB's Department of Architecture and Civil Engineering. Therefore the young researchers were encouraged to focus their enquiries on the built environment. Their research covered a variety of themes relevant to local communities, such as: the causes of the 'black crust' which disfigures the surface of the city's iconic building material (Bath stone); how to encourage local people and visitors to take a greater interest in the urban environment and its history; the development of alternative building materials and an effective way of nudging householders into reducing energy consumption.

The journey has only just begun. But for all of the participants it has already been a life changing experience.

## Preamble.

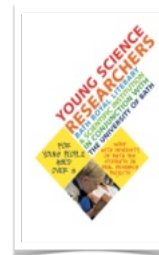


### 'BRLSI Researchers: Supporting enthusiastic enquiries into science, learning and life'

This project has involved developing educational practice, which puts the young person and their interests at the centre of learning.



BRLSI Youth, in collaboration with the University of Bath's Public Engagement Unit and Department of Architecture and Civil Engineering, secured a small EPSRC grant to pilot an innovative educational opportunity for young people (13yrs+) researching the Built Environment and developing their reflective research journals supported by PhD/Post-Doctoral students.



Participants met monthly for 7 months to develop their research, devise experiments to test their hypotheses, implement experiments and analyse results, as they would in a university context.

The PhD/Post-Doctoral students acted as research supervisors and the young people as researchers.

The sessions included time for reflection, 'supervision', participation in a research group, introducing skills researchers need to be effective, and opportunities to present to an audience.

### All participants in the project learned from, and with, others.

The young researchers developed their knowledge of themselves, what it is to be a researcher, deepened their understanding of their own learning processes, and developed their confidence and ability to generate and research questions of interest to them. The PhD/Post-Doctoral students refined and deepened their educational practice and understanding of supervising knowledge creating research, communicating and sharing knowledge, and supporting learning. The project leaders researched their educational influence in learning and this innovative educational opportunity to improve it.

In autumn 2014, Paul Thomas, the originator and convener of Young BRLSI, in collaboration with Paul Shepherd of the Department of Architecture and Civil Engineering of the UoB, and with support from the UoB Public Engagement Unit, secured a small grant from the EPSRC research council. The purpose was to enable young people and postgraduate students to work together, to develop their expertise and knowledge as expert science researchers and life-long learners, by researching questions of personal interest. It was also an opportunity to research the educational implications of a practical expression of the Young BRLSI philosophy.

The plan was for a project to offer 6 monthly workshops and to culminate in a mini conference where the research could be presented. As with all good plans, the project evolved, and continues to do so, fuelled by the knowledge and understandings created. The story of the project is told through the accounts of some of the research and the learning of the participants.

As researchers we have a responsibility to contribute to the edification of others and ourselves by making our knowledge publically accessible. This publication is one of many forms we are using to communicate to a wide and diverse audience. This publication has been created for an audience of those with an enthusiasm for developing learning opportunities for young people and postgraduate students as life-long learners contributing to and benefitting from their own learning and that of others.

We hope that this publication will:

- Commemorate what we did, how we did it and what we learned
- Disseminate our work, not only our findings, but also our journeys as researchers
- Allow people to learn from what we have done to improve what they are doing
- Influence educators' and academics' educational practice.

We begin by setting the scene in Part 1 by introducing the principle participants, the context, history and aims of the project. In Part 2 we describe briefly what happened session by session. So the flow of our narrative is not interrupted we provide extra documentation in the Appendix. In Part 3 we each present some of what we have learned. We conclude in Part 4 with the rationale underpinning the project, our evaluation, key points of learning that have emerged through the project and implications for possible future developments.

The success of our efforts to make our knowledge publically accessible can only be known over time. It will be evidenced by whether or not our account stimulates your imagination and contributes anything to your efforts to improve educational experiences and learning as you develop your own science and educational research projects. How could we improve our account? What are you doing that we could learn from? We would really love to hear from you – [coolbookings@brlsi.org](mailto:coolbookings@brlsi.org)

## **Part 1 Setting the Scene**

We begin by introducing participants and then telling you something of the history and mission of the Bath Royal Literary and Scientific Institution, Young BRLSI and the BRLSI Researchers project.

### **1.1 Main Participants**

#### *Project team*

Paul Thomas, BRLSI Researchers Project Leader and 'Young BRLSI' Convenor: Graduate of Oxford, Bristol and Exeter Universities. Retired writer, artist and academic, Paul T has lived locally since 1968. He is passionate about research and encouraging young people to be involved in STEM. He initiated and has been responsible for the 'Young BRLSI' programme since 2012.

Paul Shepherd, BRLSI Researchers Project Leader: After completing a Degree in Maths (Cambridge) and a PhD in Fire Engineering (Sheffield), Paul S joined international consulting engineers Buro Happold where he developed specialist software and used it to design large complex buildings such as the Emirates and Lansdowne Road Stadiums, working with some of the world's most influential architects. Now an academic in the Department of Architecture and Civil Engineering at the University of Bath, he uses the skills and experience he gained in industry to inspire the next generation of built environment professionals, and to research new ways of using computers to improve the building design process. He is also a passionate Public Engagement advocate, and regularly presents to audiences of 1000 school pupils about the use of maths in real world applications through his work with MathsInspiration.com.

Marie Huxtable, BRLSI Researchers Project Leader: Developed a lifelong interest in psychology during a degree course at Hull University and subsequently a commitment to contribute to improving the educational experiences and learning of children and young people by qualifying and practicing as an educational psychologist. She developed her passion and commitment to researching educational practice to improve it during her doctoral research at University of Bath. She has continued her research as a visiting research fellow with University of Cumbria, an editor of the Educational Journal of Living Theories, and working with learners of all ages engaged in researching their passions for learning and making a difference that contributes to the flourishing of humanity.

#### *Supervisors with their research teams*

Muzzamil Shakil, BRLSI Young Researchers Supervisor: Previously studied Civil Engineering and currently a PhD researcher in Low-carbon cementitious materials (both at the University of Bath). Interested in engaging and inspiring the younger generation through research: passionate about yoga and running on trails.



**Figure 1 Joe, Oliver and Barnabas**

Joe Williams, BRLSI Young Researchers Supervisor: PhD candidate at the University of Bath and former graduate with an MEng in Civil and Architectural Engineering. STEM ambassador and keen participant of several university public engagement programs. Particularly interested in promoting engineering and sustainability to future generations.

Barnabas, BRLSI Young Researcher: Studying for GCSEs at Kingswood School in Bath. Favourite subjects are Chemistry and History.

Oliver Sani, BRLSI Young Researcher: A Ralph Allen student, who enjoys skiing and science! Has appreciated the opportunities provided by BRLSI since the age of about 10.



**Figure 2 Giovanni and James**

Giovanni L. Pesce, BRLSI Young Researchers Supervisor: Post-doctoral research associate at the Department of Architecture and Civil Engineering. Graduate of Genoa (Italy) and Bath (UK) Universities. Lives in Bristol with his partner. Inquisitive person, he is passionate about research and loves Richard Feynman's books (e.g. "The pleasure of finding things out").

James, BRLSI Young Researcher: Enjoys maths and science, especially Elements and the Periodic Table. Also a junior croquet player and a keen horse-rider. Attended the younger children's science workshops in 2013 and joined the Young Researchers group in October 2014. Has enjoyed working with the PhD students and getting involved in the research project.

Ammar, BRLSI Young Researchers Supervisor: Graduate of Salford University with a Masters in Project Management in Construction, he is currently doing his PhD in Architecture at the University of Bath. Before his Masters, Ammar graduated as the top student at Al-Baath University, Homs, Syria in 'Architectural Engineering' Bachelors degree. Interested in combining art with architecture and engineering, he has exhibited his artwork in Germany, the UK and Syria and recently was the curator of the 'Poetry of Line' Exhibition at the University of Bath.



**Figure 3 Ammar, Mari and Molly**

Mari, BRLSI Young Researcher:

Molly, BRLSI Young Researcher:





**Figure 3 Teresa with Nicola and Kitty**

**Teresa Chiang, BRLSI Young Researchers Supervisor:** Teresa obtained her PhD in Architecture from the University of Bath whilst working on the Young Researchers Project. She joined the project to develop her learning about working with young people interested in STEM and to gain experience in public engagement.

**Nicola, BRLSI Young Researcher:** Has lived in Somerset since birth. She loves research, likes to try new things, is very inquisitive about new opportunities and takes them with enthusiasm. She hopes to become a science journalist in the future.

**Kitty, BRLSI Young Researcher:** Attends Hayesfield School

**Georgia, BRLSI Young Researcher:** Attends Hayesfield School

## 1.2 The Bath Royal Literary and Science Institution

Bath Royal Literary and Scientific Institution is a registered charity. It exists to promote an interest in the arts, literature and sciences in Bath [UK] and the surrounding area and provide resources for education, research and enjoyment. It acts as a cultural centre for its members and the public and provides a wide-ranging programme of lectures, discussions, science demonstrations and exhibitions. Anyone can become a member and anyone can attend its activities. (Thomas, 2014, p. 111)

BRLSI was founded in 1824 as the direct descendant of Bath societies going back to the 1770s and re launched and registered as an Education Charity. 15 years ago BRLSI members initiated the annual 'Bath Taps into Science' event, which has gained in popularity and is now organised by the University of Bath. It offers local schools and members of the public two days of fun 'hands on' STEM activities. Since 2010 BRLSI has invited research students from the University of Bath to deliver short lectures on their research and offers supportive feedback.

## 1.3 Young BRLSI

Young BRLSI began in September 2012. Its premise is to bring (self-selected) school age children and young people from across the area together and provide them with challenging and fun learning opportunities, which are not directly related to the existing school curriculum. These workshops take place in the context of 'hands on' and 'discovery' learning activities and enquiry led learning, and concentrate on Science, Technology, Engineering and Maths (STEM). In this way it is hoped that the aspirations of children will lead them to consider STEM

subjects as a career choice and inspire local communities to consider STEM as something relevant to their own local areas.

To deliver the workshops, a team of volunteers was recruited from the BRLSI membership, graduates and undergraduates from the University of Bath, Bath Spa University, Norland Childcare Training College and STEM Ambassadors from Industry. Volunteers are encouraged not to tell the participants anything, but to ask open-ended questions. The aim is that through participation in the BRLSI Youth Activities workshops, children work with others, retain a sense of curiosity, a passion for enquiry, the confidence to develop and test the validity of their own explanations, share the knowledge they create, and present what they have learned.

Volunteers also learn. The core skills are about effective communication, sensitivity to the process of individual learning, the ability to reflect on participants learning and their own learning, and knowledge of how to support educational enquiry. In the case of volunteers without a STEM background they also learn, side by side with the children, about the scientific content of the STEM activities.

Volunteers contributed in February 2013 to the following clarification of the purposes of the programme, which provides the basis for development, implementation and evaluation:

- To enable children and young people to experience passionate learning and serious fun in a relaxing academic environment
- To foster a love of science in young people
- To foster a love of enquiry
- To provide STEM opportunities for children beyond those restricted by school curricula.
- To increase the knowledge and experience of children, young people and adults as researchers.
- To bring young people and adults (family members such as parents and grandparents) into BRLSI
- To enhance the contribution BRLSI makes to the academic quality of knowledge for local people
- To help BRLSI realise its mission as an educational charity concerned with the promotion and advancement of science, literature and art

All the activities involve collaborative, active learning, problem solving and use the analytic, creative thinking and planning skills that the 'expert' uses. Most activities involve a 'product' of which participants can feel proud, and include suggestions which aim to encourage participants to extend their thinking and learning and explore additional possibilities.

The workshops provide an opportunity for children over 8 years of age to learn with student volunteers over 17 years of age, postgraduate researchers, BRLSI members and STEM Ambassadors. But it was felt that the workshop format is

not so well suited for young people over 12, and as BRLSI wished to retain their interest, an alternative had to be found.

Early in the autumn of 2014, Paul T was invited to a seminar by the Public Engagement Unit of the University of Bath. One of the exercises was to put in a bid for research council funding ring-fenced by the University for a Public Engagement project. Paul S, and Paul T were in one of the groups. Their proposal was that Paul S would invite PhD and postdoctoral researchers from his department to join the proposed programme where the students would act as mentors and share their research. This would provide teenagers with an insight into what it was to be a researcher, give them experience of working with 'real researchers', and provide the university researchers with an opportunity to experience and reflect upon what it is like to supervise research. Paul S and Paul T developed these ideas into a formal bid, which the University of Bath accepted and offered funding, and so the programme was born.