

# Phiz Lab



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## Setting up a Primary School Science Laboratory: Beginners Guide

SHINE  Labs

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## INTRODUCTION

Three years ago at Shrubland Street Primary School, Leamington Spa, an underused classroom was converted into a simple school science laboratory. The main reason for this project - to improve the quality of science learning and teaching throughout the school. Benefitting from having an experienced science teacher on the leadership team, the school was able to make the most of the expertise available to them. Early in the project, representatives from The Ogden Trust came to visit the lab and saw the facility as;

- An innovative way to raise the profile of science in primary schools
- A learning environment aiming to improve the learning experience for children and help raise aspirations for all children (especially those from disadvantaged backgrounds).

The Ogden Trust supported the project and also branded this learning environment Phiz Lab #1. Since then many more Phiz Labs have opened and by January 2016 there will be 11 Phiz Labs across the West Midlands.

The Ogden Trust is also collaborating with SHINE and the Primary Science Teaching Trust (PSTT) to set up a further 6 labs across London which are to be called SHINElabs and will be opening during the academic year 2015-16.

Currently the Trust is looking at rolling out the Phiz Lab programme to schools in the Northwest and the Northeast as well as other areas across the UK. The purpose of this guide is to share with you the experiences and ideas of the people running existing labs in primary schools to give you a starting point if you are considering setting up a science laboratory in your own school.



## BENEFITS

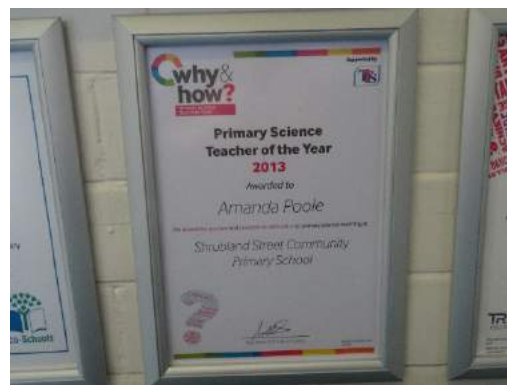
Currently, many of our evaluations and judgements are circumstantial. Our best measure of the success of this project so far is the number of our science lab schools who are achieving recognition for their achievements through the gaining awards such as PSQM Gold, SEQM Gold and other accolades such as PSTT Primary Science Teacher of the Year and TES Science Team of the Year.



The schools running labs at this time say that initial findings show clear benefits to the school including;

- Improved progress and attainment in Science
- Better quality of learning and teaching in Science
- Development of effective partnerships
- Raised science profile
- Raised aspirations of pupils
- Increased parental engagement
- Basic skills development
- More balanced curriculum coverage

As an organisation, The Ogden Trust wants to look at the impact of labs in more detail and as such is embarking on a research project to seek evidence to support or refute these initial claims. Should you be in the process of setting up your own primary science laboratory and want to take part in this research then please contact the primary team through [wendy.cox@ogdentrust.com](mailto:wendy.cox@ogdentrust.com)



## IDENTIFYING YOUR SPACE

Finding a primary school which has a spare or empty classroom is quite rare, however if your school does have this facility then identifying where your lab will go is reasonably straightforward. Schools without spare classrooms have utilised a range of spaces to create their labs. Examples include;

- Converting a resource room or large store cupboard
- Building a Biodome as an outdoor science lab
- Using a disused London bus in the playground
- A modular temporary classroom in the school grounds
- Constructing an eco-building in the school grounds

Some schools do not have the capacity for any of the above, but still want to create their own idea of a lab in a primary school, for this reason, we are trialling a 'Phiz Lab on Wheels!'. This is a trolley, carefully stocked with all the resources needed to turn the classroom into a laboratory. The 'Phiz Lab on Wheels' is then timetabled for use across the school so all classes get the benefit of the resource.

Once you have your space, you then need to think about how to furnish it. Key things to think about when designing your space;

- The installation of a sink or sinks
- Maximise the storage space for science equipment
- Appropriate flooring (to withstand practical science!)
- Display boards

In many cases, primary labs are just adapted classrooms that are dedicated to science learning and don't need too many specialist items. Nevertheless some well-established labs are now redeveloping their space to become more like a real laboratory adding resources such as a Mobile Primary Science Bench to enable demonstrations with a Bunsen burner.



## GETTING THE MOST OUT OF YOUR LAB

Once your Phiz Lab is set up, you will need to plan carefully how you will maximise the potential use. If you have a large school with two or more form entry you will have no difficulty ensuring that there is always a class in the laboratory working on science learning projects. Nevertheless you will need to carefully timetable the lab, so that every class has its allotted slot and the resource never goes to waste.



If however you are a small school, you may find that there are certain parts of the week where the lab is not being used by pupils. There are so many other ways that you can utilise this space for the benefit of your school and the wider community.

Firstly, consider using the room for STEM lessons that combine maths and science. This would allow classes to use the lab for additional time to develop their maths skills in a practical context.

Many of our schools choose not to timetable EYFS classes to use their Science Lab, however, with gaps in the timetable you can provide opportunities for Early Years children to come and participate in science exploration days or half days.

If you still have capacity in the week, when the lab is not being used, it is a great facility for engaging with the local community - offer the lab to local schools to come in and use for a half day or use the lab as a venue for CPD courses or partnership meetings.



## CREATING A SUPPORTIVE LEARNING ENVIRONMENT



It is important that the lab is set up to support children in their science learning, encouraging them to be more independent in their planning and carrying out of enquiries. Displays such as key vocabulary for both working scientifically and subject knowledge should be present at all times. Existing labs have found a Working Scientifically target board very useful in supporting children meeting their learning goals and challenging children to move on and work in greater depth.

As science is all about curiosity and asking questions, it is essential that your lab has a wall dedicated to questioning; encouraging children to use a variety of language, to develop their own questions about what they observe in the world around them.

Recently some of our labs have begun to focus on different types of enquiry and have created displays of success criteria for each of these;

- Research
- Fair and comparative tests
- Pattern seeking
- Identifying and classifying
- Observing over time

Initial findings show this is a very useful tool in accelerating children's progress in different types of enquiry as well as supporting children in deciding which type of enquiry they should use to find the answer to their big questions.

Other types of displays that support independent learners include;

- Scientific diagrams modelling how to draw in 2D and add labels
- Model bar charts, scatter graphs, line graphs, and tables are all useful references for children to support their independent enquiry work and reporting
- Modelling mathematical skills, such as calculating averages, measuring accurately and reasoning skills can also support children's data analysis



## CREATING AN ENGAGING LEARNING ENVIRONMENT

As well as supporting learning, the Primary Science Lab should inspire children and generate curiosity. Displays should celebrate high quality achievements through;

- Lab Reports
- Photos of practical enquiry in action
- Models that children have created to demonstrate their learning
- Equipment or artefacts with questions to stimulate thought
- Big Questions

Some of our labs have a dedicated noticeboard to highlight the three areas of science - biology, chemistry and physics – where the work clearly shows progression in these areas of learning. Other labs have a dedicated noticeboard for each class that works in the lab and sometimes the children themselves help set up and maintain these displays.

An additional noticeboard to share and celebrate enrichment activities such as field trips, after-school clubs and science fairs are a wonderful addition to the lab. This will build excitement for younger children for what they have to look forward to, promote discussion and encourage more children to get involved in optional activities.

Many labs have created displays to celebrate all the partnerships they have developed with other schools, universities and STEM ambassadors as well as outside organisations that are supporting them in their work.

Drawers of equipment should be clearly labelled as this not only helps children locate equipment for themselves, but it supports the use of the correct scientific vocabulary and their spelling of this vocabulary when reporting their learning.

Science is a great area of the curriculum through which schools can promote reading and we strongly recommend the display of quality scientific books for reference to be used in lessons to help children find answers to their own questions. This is also a wonderful way to extend children who have completed their work in lessons.

Finally the New Curriculum places significant importance of taking science learning outside – find innovative ways to represent this in your lab – either through displays or perhaps a set of hooks with Science Explorers expedition kits in rucksacks (clipboards, pencils, tape measures, identification keys, antibacterial gel, sample pots/bags, magnifying glasses, compass etc).





### PLANNING A CURRICULUM

Whilst investing all this time and effort into setting up a primary science laboratory, the most important consideration has to be the quality of learning and teaching that goes on in this space. The main starting point here is to have a well-planned science curriculum that teaching staff have ownership of and supports the delivery of high quality learning experiences for children.

Some of our partnerships have created simple plans for the introduction of the new Primary Science Curriculum. These can be accessed through the TES resources site [https://www.tes.com/teaching-resources-shop/OgdenPartnership\\_LeamingtonSpa](https://www.tes.com/teaching-resources-shop/OgdenPartnership_LeamingtonSpa).

When you are confident that you have full coverage of the new Primary Science Curriculum, your school can begin to think creatively about how you might develop your young scientists through project-based learning within a context. One of our Phiz lab schools is developing a new curriculum which encompasses all of the National Curriculum requirements, through a six-month Space Science Project followed by a six month Life on Earth project. You might want to consider doing something similar and building on the strengths and interest of your teaching team as well as making the most of your locality and community.

### ASSESSING PROGRESS

In this time of change, assessment in primary schools is rather unclear, but what is clear, is the importance of high quality formative assessment to acknowledge pupils' achievements but more importantly identify their next steps to make progress. The Ogden Primary Team has been working on developing resources to assist with this, which are also available through TES resources.

We have developed some quick quizzes to support teachers in their judgements at the end of units as well as tracking systems and a variety of self and peer assessment tools.

As a primary school with a science laboratory, we would strongly recommend that you treat your assessment data for Science with the same level of scrutiny that you give to English and Maths. A leadership team that does this will really communicate to their teaching team the importance and value of this area of the curriculum in their school. In addition, taking this approach will allow you to share your progress with governors and support your quality assurance systems.



## RESOURCES

### Physics Resources

Orrary/Phases of the Moon Model/Globe  
Tuning Forks/Various Tubes  
Springs  
Rokit Kits and Pumps  
Telescope/Binnoculars  
Mirrors Plane/Curved  
Light gates (pair)  
Voltage Sensors  
Torches (variety)  
Prisms  
Perspex Blocks Various Shapes  
Lenses  
Newton Meters (Various push/pull)  
Trolleys and ramps  
Pulleys and Friction Blocks/Gears  
Circuit Maker Breaker  
Plasma Ball  
Fun Fly Stick  
Circuit Kits (Batteries, Lamps, Switches, buzzers, motors, wires and croc clips)  
Magnetism Kits (Various magnets and compasses)

### Chemistry Resources

Filter Paper  
Funnels  
Thermal Conductivity Apparatus  
Metal ball and ring expansion experiment  
Various Metal Samples (named)  
Stirring Rods  
Test tubes  
Test tube Racks  
Evaporating Basins  
Syringes  
Beakers (various sizes)  
Heating Apparatus  
Conical Flasks  
Salt, Sugar, Bicarbonate of Soda  
Vinegar, Lemon Juice, Citric Acid  
Oil,  
Watercycle Model  
Rocks (including magnetic rocks)  
Soils  
Plastic Containers of mixed materials

### Biology Resources

Human Torso  
Foam Heart Model  
Microscopes (RMS)  
LCD Microscope  
Magnifying Glasses  
Parts of a flower Model  
Teeth Model  
Foam Plant growth model  
Eye and Ear Models  
Heart Rate Sensors (for data logger)  
Pooters/ Bio Bug Viewers  
Bones- Various Animal  
Human Skeleton Large  
See n Speak Binoculars  
Seeds  
Gardening Tools  
Plastic Insects to identify and classify  
Fossils  
Food labels

### Working Scientifically Resources

Retort Stand, Boss and Clamp  
Stopwatches  
Thermometers Demonstration  
Thermometers 0-100°C  
Measuring Cylinders (various sizes)  
Pipettes  
Digital Scales (2-4 sets)  
Slotted Masses (10g and 100g)  
Sample Pots  
Petri Dishes  
Lab coats  
Safety Glasses  
Washing Up Bowls (White)  
Data Loggers  
Temperature Sensors  
Various types of string  
Disposable plastic cups and containers  
Metre rulers  
Tape Measures  
Wooden blocks

## REPORTING

In setting up a lab and your primary school you are acknowledging that science is a highly valued and core aspect of your curriculum. As such, it should be considered with the same rigour as English and Maths and so subject leaders should quality assure all aspects of science across the school in a structured manner.

One of the best ways to do this is to work towards Primary Science Quality Mark (PSQM) as this is a well planned programme, in which you audit where you are, develop action plans to move on and then demonstrate the progress that you have made. In addition to this, there are other similar programs such as the Space Education Quality Mark and Eco-Schools Awards.

We would strongly recommend having a school governor dedicated to science in your school who can support both the subject leader and the headteacher in reviewing the quality of science across the school. The school should seek to quality assure their science provision through all of the usual means including work scrutiny, pupil voice work, parent voice work, teacher voice work and of course tracking progress and attainment for all.

Finally we would strongly recommend that schools consider reporting science attainment and progress in exactly the same way and with the same frequency as they do for English and Maths as this acknowledges the value that your institution places on this area of the curriculum.



## RAISING ASPIRATIONS

A priority for many of our Phiz Labs is building strong relationships with local universities. We believe that university academics are fantastic role models for children and can share their love of science, as well as show children the wealth of opportunities available to them to extend their education beyond school. Although primary school children have a long journey until deciding to go to university, we feel that for children with no experience of university, this is a vital part of their early education for planting those seeds and raising aspirations.



Similarly, many of our labs utilise the wealth of free STEM ambassadors who are happy to come into schools and talk to children about their work as well as run workshops. This helps children see the relevance of their science learning as well as giving them a broad insight into the huge variety of STEM careers available to them. Local STEM organisations will be able to put you in touch with ambassadors in your area, eager to work with you - you can find out more about this here [www.stemnet.org.uk/ambassadors/](http://www.stemnet.org.uk/ambassadors/)



## ENRICHMENT

As centres of excellence in Primary Science, the enrichment program delivered from a primary science laboratory is as vital as the quality curriculum. This is a real opportunity to engage and enthuse as well as develop further links with STEM ambassadors and academics.

Many of our labs offer after-school STEM clubs or Science Clubs working with STEM ambassadors on projects such as Robotics, Structural Engineering, Vehicle Design, Forensics Science and Astronomy. A number of clubs have set up extra curricular eco-clubs to support the biological aspects of the curriculum and take learning outside. A number of schools have developed collaborations with local secondary schools to train Sixth Formers to plan and deliver Science Clubs. This not only benefits the primary school but also benefits the Sixth Formers who can work towards CREST silver and gold awards.

In a quest to increase girls into physics many of the Phiz labs are now looking at setting up STEAM clubs which combines Science, Technology, Engineering and Maths with Art.

An annual Science Fair is a fantastic way to celebrate all things Science in your schools. An increasing number of our primary partnerships are now running their own individual Science Fairs and then bringing their winners together for a Partnership Science Fair in local Secondary Schools or Universities.

There are so many fantastic field trips that you can organise to support and extend the curriculum from the huge range of Science Museums across the country to local areas of scientific interest. Remember to advertise some of the amazing Science day trips that families can have in your school newsletters to encourage learning to continue at home.



## COLLABORATING WITH THE WIDER COMMUNITY

As there are so few schools with a primary science lab, we feel a very important aspect of their work should be to engage with the wider community, supporting other schools and organisations in developing high-quality science education for all. Many of our Phiz Lab schools are also the base for Ogden Partnerships where a group of schools work together, regularly meeting to share ideas and participate in continuing professional development events.

There are huge advantages to having a Primary Partnership for science coordinators as they can share the load of their responsibilities and collaborate to develop different aspects of the science curriculum. Many existing partnerships come together for combined enrichment activities such as an annual science fair, KS2 Physics Conferences or even a collaborative field trip to a theme park for a 'Forces and Rollercoasters' day.

The wider community also includes local families and people living in within the vicinity of the school and many of our schools organise a programme of family learning nights. This brings in a variety of people from the local community to sharing the learning experience with a science expert such as an Astronomer, Engineer, Particle Physicist or Chemist.

So that you increase the impact of your work on the largest possible number of educators, we strongly recommend utilising social media to network beyond your local area and develop links with educators both nationally and internationally. Many of our schools are setting up their own lab Twitter pages and are using this to share all the good practice going on in their schools as well as follow like-minded organisations to get new ideas about how to make things even better in their own setting. We are finding the Internet a very valuable way of networking with different organisations that would be keen to work with you on trailing resources, funding projects and visiting your school as STEM ambassadors. Follow @ogdenprimary @phizzinews @spacecampuk @phizlab\_SSP !



## CREATE A LAB SUPPORT TEAM

Obviously teaching in a primary school is an extraordinarily demanding job with very little time to do everything that needs to be done. Realistically, setting up a primary lab is going to involve more time in organisation, planning and running enrichment events. We advise schools to plan ahead for this and work on developing a support team that can share the load of your science coordinators and support them in really getting the most out of their resource.

One way in which this can be done is to employ a teaching assistant as a dedicated science technician for part of the week. One of our schools has done this with the teaching assistant having five hours a week dedicated to supporting Science Education across the school. This works well with organising events, getting equipment ready or repaired, ordering new equipment and developing support resources for lessons. It's a great opportunity to help develop a talented teaching assistant and support them in having the greatest impact in the school as possible.

Virtually all of our Phiz Labs have advertised the role of Science Assistant to Year five and Year six pupils. The children write a letter of application and then go through an interview procedure (see Appendix 2). Appointed children get to wear an Ogden Trust Science Assistant badge and support the Science Coordinator through getting equipment ready for lessons, to writing the termly Science Newsletter. Schools have also found that these excellent Science Ambassadors are effective at supporting learning of younger children in the school and speaking to guests about their own experiences of Science in the School. Some labs have also sought the help of parents to fund raise for reference books and other equipment, as well as developing a network of enthusiastic parents who will support with outdoor learning and field trips.

Schools with Science Governors find that this again adds to their support team, not only for Quality Assuring what happens in science but also in communicating with the governing body about projects and activities that are going on in the lab. Many Science Governors are also keen to support with outdoor learning and field trips as additional enrichment events.



## APPENDIX 1

### USEFUL WEBSITES

<http://www.esero.org.uk>

[www.nationalstemcentre.org.uk/primaryscience](http://www.nationalstemcentre.org.uk/primaryscience)

<http://www.primaryupd8.org.uk/>

<http://www.planet-science.com/>

<http://www.rsc.org/learn-chemistry/newsletter>

<http://www.reachoutcpd.com/>

<http://www.pstt.org.uk/resources/continuing-professional-development.aspx>

<https://www.tes.co.uk/mypublicprofile.aspx?uc=3856218&profileTab=resources>

[www.rigb.org/experimental](http://www.rigb.org/experimental)

[www.psqm.org.uk](http://www.psqm.org.uk)

[www.ogdentrust.com](http://www.ogdentrust.com)

<http://www.ase.org.uk/>

[www.rigb.org/education/science-in-your-school](http://www.rigb.org/education/science-in-your-school)

#### **Practical Resources**

Science Demonstration Bench <http://www.irwinscienceeducation.com>

Biodomes for Schools <http://biodomesystems.com>

TTS <http://www.tts-group.co.uk/>

SciChem <http://education.scichem.com>

Timstar <http://www.timstar.co.uk/>

Better Equipped <https://www.betterequipped.co.uk/>

Phillip Harris <http://www.philipharris.co.uk/>



## **Funding Opportunities**

Biochemical Society [www.biochemistry.org/Grants/ScientificOutreachGrants.aspx](http://www.biochemistry.org/Grants/ScientificOutreachGrants.aspx)

British Ecological Society [www.britishecologicalsociety.org/grants-awards/outreach-grants/](http://www.britishecologicalsociety.org/grants-awards/outreach-grants/)

Holmes Hines Memorial Fund [www.epsrc.ac.uk/funding/howtoapply/routes/pe/holmeshinesfund/](http://www.epsrc.ac.uk/funding/howtoapply/routes/pe/holmeshinesfund/)

Royal Society [www.royalsociety.org/education/partnership/](http://www.royalsociety.org/education/partnership/)

Royal Society of Chemistry [www.rsc.org/Membership/Networking/InterestGroups/BMCS/education-support-group/chemistry-clubs.asp](http://www.rsc.org/Membership/Networking/InterestGroups/BMCS/education-support-group/chemistry-clubs.asp)

Science and Technology Facilities Council – [www.stfc.ac.uk/1838.aspx](http://www.stfc.ac.uk/1838.aspx)

Society of General Microbiology [www.sgm.ac.uk/en/grants-prizes/education-outreach-funds.cfm/microbiology-in-schools-fund](http://www.sgm.ac.uk/en/grants-prizes/education-outreach-funds.cfm/microbiology-in-schools-fund)

STEM Directories Grants [www.stemdirectories.org.uk/teacher-faqs/](http://www.stemdirectories.org.uk/teacher-faqs/)

Tesco Charity Trust Community Awards [www.tescopl.com/index.asp?pageid=754#ref\\_index.asp?pageid=121](http://www.tescopl.com/index.asp?pageid=754#ref_index.asp?pageid=121)

Waitrose Community Matters [www.waitrose.com/home/inspiration/community\\_matters.html](http://www.waitrose.com/home/inspiration/community_matters.html)

Wellcome Trust People Awards [www.wellcome.ac.uk/Funding/Public-engagement/Funding-schemes/People-Awards-and-Society-Awards/](http://www.wellcome.ac.uk/Funding/Public-engagement/Funding-schemes/People-Awards-and-Society-Awards/)

## **Twitter**

@ogdenprimary

@phizzinews

@spacecampuk

primaryscience@ccs\_phizlab

@ogdentrust

@ogden\_bidford

@phizlab\_SSP

@ccs\_PhizLab

@ogdenprimary\_NW

# Amazing Opportunity



## Voluntary Position School Science Assistant



We are looking for two reliable, hardworking and enthusiastic children to be our School Science Assistants for the next twelve months. The roll will involve supporting teachers in setting up science lessons, helping with the annual science fair and after school science clubs. Successful applicants will also help with keeping science displays around the school up to date and have to speak to visitors about what science opportunities there are for children in the school.

### Skills required:

- Passion for science
- Punctual
- Reliable
- Creative/innovative
- Good Communicator
- Excellent role model
- Good organisation skills



making physics matter

### To apply:

Send an A4 letter of application; explain why you would be great for the position, to the school office by Friday 17<sup>th</sup> June.

Interviews will take place in the following week.

We look forward to hearing from you.

# APPENDIX 3

## DISPLAY RESOURCES

