

# Outreach & Public Engagement

Mariam Rashid, Jodrell Bank Centre for Astrophysics, University of Manchester

## BEFORE LOCKDWN

I was involved with a handful of projects before lockdown, but my favorite was sewing the *Particle Crew*, imaged on the right.

This is a set of toys representing the Standard Model, to be used as a teaching tool with young students. The original concept comes from the Particle Zoo, a similar set which is commercially available. The big difference with the set I've designed and created is that mine are fully tactile. As I'd been working with the the Tactile Collider team that summer, inclusivity for blind and partially sighted students was at the front of my mind. As described in tables 1 and 2, each particle can be differentiated by touch and weight alone. They also have raised embroidery indicating their symbol. They live with The University of Manchester's outreach team.

### FERMIONS

No beads on the top  
Number of bumps on the plush indicates which generation of matter the particle belongs to.

#### QUARKS

Felt  
Triangular

#### NEUTRINO

Crushed Velvet  
Square

#### OTHER LEPTONS

Cotton  
Circular

### BOSONS

Beads on top

#### GAUGE

Lycra

#### SCALAR

Sequined

### TIER 0

Stuffing only  
Photon,  
neutrinos, gluon

### TIER 1

Pellets only  
Electrons, ups,  
downs

### TIER 2

Ball bearings and  
pellets  
Stranges, charms,  
bottoms, muons, taus

### TIER 3

Ball bearings only  
W bosons, Z  
boson, Higgs, Top

Table 2: In addition to the features specified in Table 1, each particle belongs to one of these weight tiers. Lighter particles are lighter toys.



Figure 1: The Particl Crew

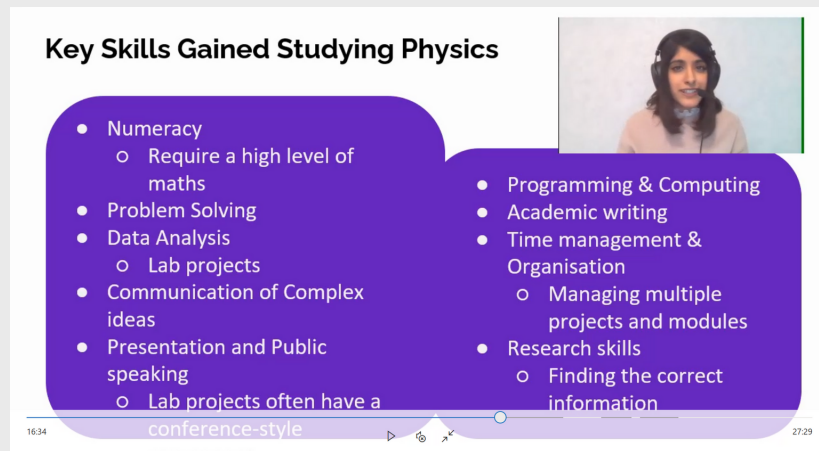
Table 1: The fabrics and other outer indicators used to distinguish between the particles. These are all features that can be determined without visual aid.

## DURING LOCKDOWN

COVID-19 has brought a unique set of challenges for us all. In outreach, many events were cancelled and we were no longer able to visit schools.

Widening Participation Fellows at The University of Manchester have been working to create online sessions which can be delivered in schools. These include workshops exploring specific topics about your subject, as well as more general 'Why Study' talks, highlighting the benefits of University. As a WPF, I have had the opportunity to develop such talks.

In figures 2 and 3, you will find screenshots of my 'Illuminating Dark Matter' and 'Why Study Physics' talks. I did the design work, recorded and edited these talks. When designing an online workshop as opposed to an in-person one, there are new challenges to overcome - it's harder to remain engaging and impossible to read the room. We received some advice in one of our training sessions, which was to remember 'you have to be more engaging than that cat video on TikTok!' I think I achieved this, as my Illuminating Dark Matter workshop has now been booked and tried by a Year 12 group and the feedback was humbling to say the least.

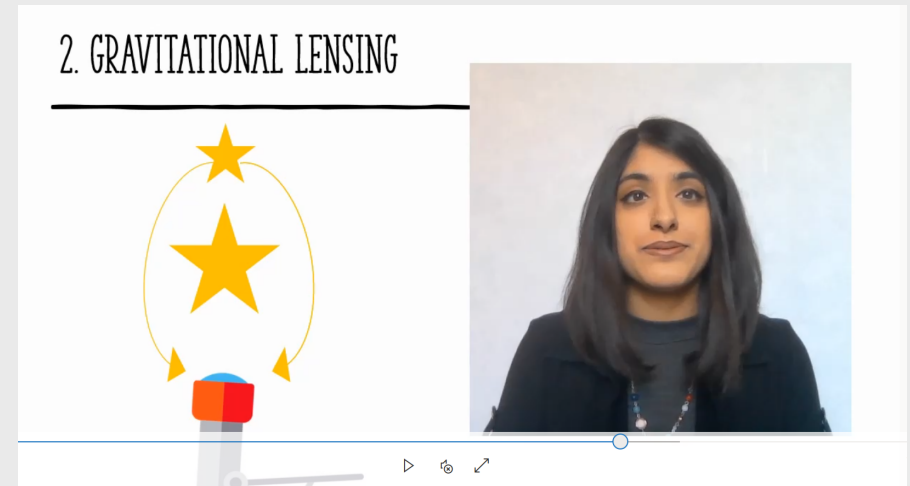


**Key Skills Gained Studying Physics**

- Numeracy
  - Require a high level of maths
- Problem Solving
- Data Analysis
  - Lab projects
- Communication of Complex ideas
- Presentation and Public speaking
  - Lab projects often have a
- Programming & Computing
- Academic writing
- Time management & Organisation
  - Managing multiple projects and modules
- Research skills
  - Finding the correct information

conference-style

Figure 3: Discussing Key Skills gained on a physics degree, during the 'Why Study' talk. General benefits of university, amongst other things, were also discussed.



**2. GRAVITATIONAL LENSING**

The diagram illustrates gravitational lensing. A yellow star is at the top, and a larger yellow star is in the middle. A red and blue telescope is at the bottom, pointing towards the stars. A yellow oval with arrows indicates the path of light from the top star, which is bent by the gravity of the middle star, creating a lensing effect. A small video inset of the presenter is on the right.

Figure 2: Explaining gravitational lensing as part of the *Illuminating Dark Matter* workshop. In this activity, the students are asked to pause the video and consider what the telescope will see. In an earlier slide, the teacher and students are walked through a GR demonstration. Bringing in these 'pause the video' elements can help keep students engaged.

## AFTER(?) LOCKDOWN

Should activities return to some semblance of normal, I have had an outreach activity in the works for some time. Funded by the Ogden Trust, I am developing a Physics themed escape room.

The Room will be set in a school's library, using a range of props that can easily be hidden in any library. The puzzles will be adaptable for different skill levels and age groups. The design work for the puzzles has been completed, I look forward to debuting this, when health and safety allows.