



SPACE TRAINING MANUAL





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Introduction

SPACE stands for **SP**atial **C**ognition to **E**nhance mathematical learning. Children in Year 2 in participating schools will complete twelve 30-minute structured LEGO® sessions over six weeks (two sessions per week) led by their classroom teacher. SPACE is a whole-class programme. We will measure the children's spatial and maths skills before and after the programme.

One Year 2 class Teacher and one Teaching Assistant and where possible, a member of the Senior Leadership Team (ideally the Maths Lead) will receive a half day of training by a team of experts from the University of Surrey. Training will draw on our popular Spatial Reasoning Toolkit (<https://earlymaths.org/spatial-reasoning/>) and will include full instructions on how to implement the SPACE programme, information on what spatial reasoning is, and research evidence of the importance of spatial reasoning for maths. Teachers / TAs will be supported to deliver SPACE throughout via regular visits from our team and via email/phone calls.

Format of SPACE sessions

SPACE is a whole class programme that all children in your class take part in.

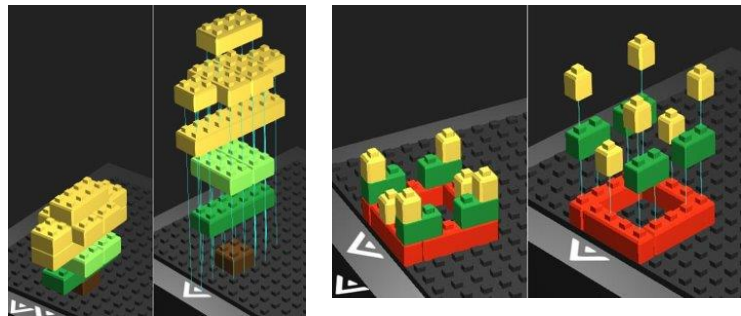
Each SPACE session includes:

- 2-minute video, explaining the context and instructions for each session.
- Children will spend approximately 20 minutes building Lego models.
- 5 minutes at the end to tidy up.

Children will be given paper booklets that they will use, one per session, to tick off and keep track of the models that they have attempted to build in that session. Once a child has built a model, they will have to dismantle their build before starting the next model in their booklet. They will be given exploded isometric diagrams (see Figure 1 below) of how to build the models, alongside images of what the finished models should look like. During the sessions, children will work alone and will only use the Lego from their Lego box. Your role will be to lead the sessions. You can use the prompt cards and what you have learned about spatial reasoning to encourage children to use skills like visualisation, spatial memory and to think about spatial representation. Try to use as much spatial language as possible, for example words like: “next to”, “longer”, and “turn”. You can offer help to the children if they need it, and redirect children back on task if they become distracted but do not build the models for them.



Figure 1. Example pictures children will receive in their SPACE booklets.



Materials needed

All materials will be distributed to you before you begin the programme. This will include:

- Lego boxes (each child will receive an A4 box with all the bricks needed for all Lego building sessions sorted by colour).
- Lego inventory sheet (this tells you which Lego bricks should be in each Lego box and is useful if any Lego boxes get muddled up. You might like to ask some older children at your school to be Lego monitors).
- Lego session booklets (these contain pictorial instructions of all the models that the children will need to build during the session. Booklets will be clearly labelled with the session title and session number. Children will add their name, school and date).
- SPACE manual (this document).
- Prompt cards.
- Video link (the correct link for the week is provided at the beginning of the information pages for each session. We will also send the correct video link via email each week).

All sessions will need to be held in a room with a screen where children can view the introductory videos at the beginning of each session.

You will also need a timer to ensure that the building activity section lasts a full 20 minutes.

End of session tasks

Once the 20 minutes building time is finished:

- Remind the children to tick off the models they attempted in their booklets.
- Remind the children to pack away their Lego bricks into their Lego Tray.
- Collect the booklets and we will collect them from you.

Additional guidance

- Please encourage children to attempt every model before moving on – we would like them to complete them in the order provided.
- Please remind the children to dismantle each model before beginning a new build.
- Children should only use the Lego in their Lego box.
- When timing the 20-minute building activity, please do not have the timer visible to children as we do not want them to feel time pressured – accuracy is more important than the number of models completed.



Please see the following pages for instructions for each session.

Text to be read aloud by the teacher / TA is in speech marks.



Week 1: Scientists

Day 1

Video (2 min): Show the children the following video: <https://youtu.be/xEl0GbKPK3k>

Video transcription: *This week you're all scientists. There are lots of plants that are close to extinction, and it's your job to get samples of all of them so that they can be kept safe and preserve them for the future. So, for the first day you're going to be building different plants, and on the second day you're going to be building the lab equipment that you'll need to preserve them. This is how you can build models out of Lego [shows one model being put together]. You'll find pictures of the models that you need to build in your booklets [shows what the page looks like]. One picture shows you what the finished model should look like, and the other picture shows you how to put it together. See if you can get your model to look exactly like the one in the picture. Once you have finished a model, tick it off in your booklet and move on to the next one. There are lots of models so you might not have time to do them all and that is ok. Good luck and have fun!*

Construction (20 min, 6 models): Read the following script

“In your books you'll find a picture of each **plant** that you need to build. On the left side, there will be a picture of the finished **plant**. The picture on the right will help you work out where to put each brick in order to make the right **plant**. Complete them in the order they are in your books. When you're done, check your **plant** against the picture to see if they match up. Try to make the **plant** look exactly like the one in the picture. Once you have tried to build a model, remember to tick it off in your booklet.”

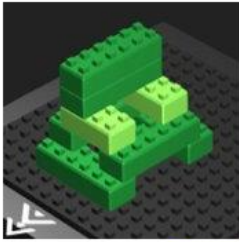
If children finish early, there is a page at the back of their booklets they can use to draw a picture on or they can play with the Lego. Encourage children to draw/build something related to the theme (scientists).



Tidy up (5 mins).

Remind children to:

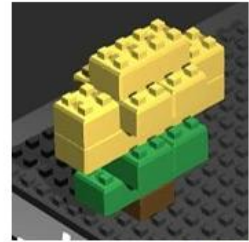
- Tick off all the models they attempted.
- Pack away their Lego bricks into their Lego Tray – all models will need to be broken down to fit in.



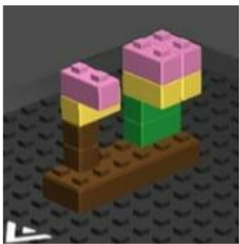
Bush



Tree 1



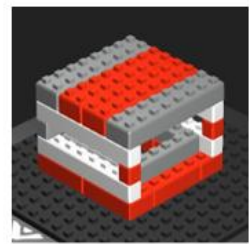
Leaf 1



Flower



Leaf 2



Lab Table

Figure 2. Images of the models in Scientists Day 1



Week 1: Scientists

Day 2

Video (2 min): (Same as Day 1) <https://youtu.be/xEl0GbKPK3k>

Construction (20 min, 6 models): Read the following script.

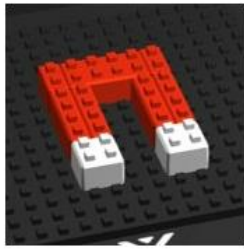
“In your books you’ll find a picture of each **piece of lab equipment** that you need to build. On the left side, there will be a picture of the finished **piece of lab equipment**. The picture on the right will help you work out where to put each brick in order to make the right **piece of lab equipment**. Complete them in the order they are in your books. When you’re done, check your **piece of lab equipment** against the picture to see if they match up. Try to make the **piece of lab equipment** look exactly like the one in the picture. Once you have tried to build a model, remember to tick it off in your booklet.”

If children finish early, there is a page at the back of their booklets they can use to draw a picture on or they can play with the Lego. Encourage children to draw/build something related to the theme (scientists).

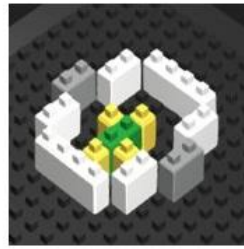
Tidy up (5 mins):

Remind children to:

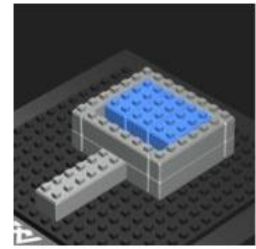
- Tick off all the models they attempted,
- Pack away their Lego bricks into their Lego Tray – all models will need to be broken down to fit in.



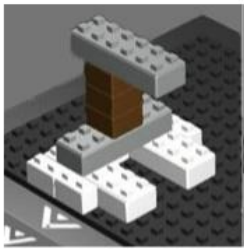
Magnet



Germ 1



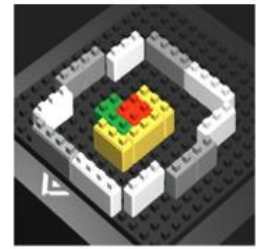
Magnifying Glass



Microscope



Flame



Germ 2

Figure 3. Images of the models in Scientists Day 2



Week 2: Pirates

Day 1

Video (2 min): Show the children the following video: https://youtu.be/N_6KppJNQu0

Video transcription: *This week you're all pirates. You've followed a map to a treasure island and need to find and collect all the treasure before heading back. So, for the first day you're going to be building different treasure, and on the second day you're going to be building different containers to put the treasure in. This is how you can build models out of Lego [shows one model being put together]. You'll find pictures of the models that you need to build in your booklets [shows what the page looks like]. See if you can get your model to look exactly like the one in the picture. Once you have finished a model, tick it off in your booklet and move on to the next one. There are lots of models so you might not have time to do them all and that is ok. Good luck!*

Construction (20 min, 6 models): Read the following script

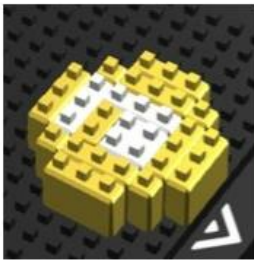
“In your books you'll find a picture of each **piece of treasure** that you need to build. On the left side, there will be a picture of the finished **piece of treasure**. The picture on the right will help you work out where to put each brick in order to make the right **piece of treasure**. Complete them in the order they are in your books. When you're done, check your **piece of treasure** against the picture to see if they match up. Try to make the **piece of treasure** look exactly like the one in the picture. Once you have tried to build a model, remember to tick it off in your booklet.”

If children finish early, there is a page at the back of their booklets they can use to draw a picture on or they can play with the Lego. Encourage children to draw/build something related to the theme (pirates).

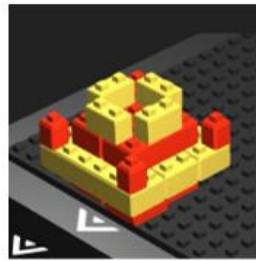
Tidy up (5 mins).

Remind children to:

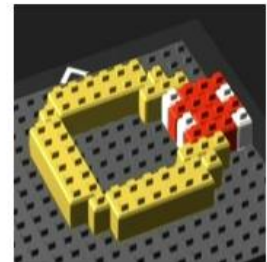
- Tick off all the models they attempted,
- Pack away their Lego bricks into their Lego Tray – all models will need to be broken down to fit in.



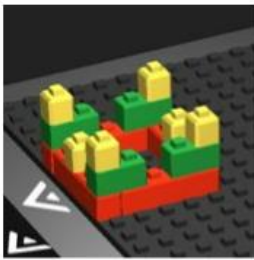
Coin



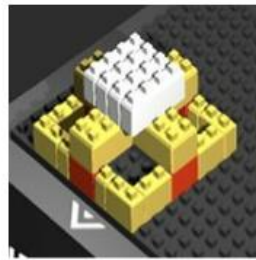
Jewel 1



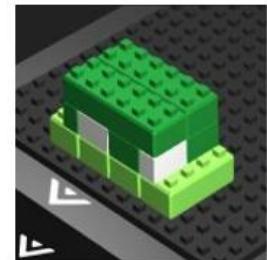
Ring



Crown 1



Crown 2



Jewel 2

Figure 4. Images of the models in Pirates Day 1



Week 2: Pirates

Day 2

Video (2 min): (Same as Day 1) https://youtu.be/N_6KppJNQu0

Construction (20 min, 6 models): Read the following script.

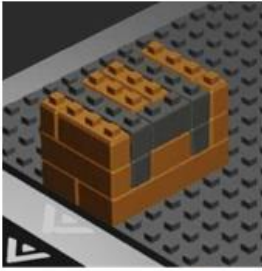
“In your books you’ll find a picture of each **container** that you need to build. On the left side, there will be a picture of the finished **container**. The picture on the right will help you work out where to put each brick in order to make the right **container**. Complete them in the order they are in your books. When you’re done, check your **container** against the picture to see if they match up. Try to make the **container** look exactly like the one in the picture. Once you have tried to build a model, remember to tick it off in your booklet.”

If children finish early, there is a page at the back of their booklets they can use to draw a picture on or they can play with the Lego. Encourage children to draw/build something related to the theme (pirates).

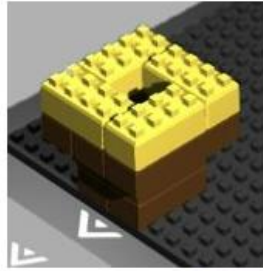
Tidy up (5 mins).

Remind children to:

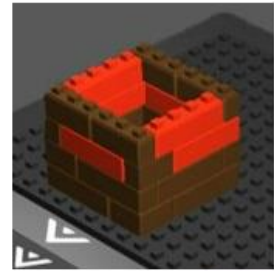
- Tick off all the models they attempted,
- Pack away their Lego bricks into their Lego Tray – all models will need to be broken down to fit in.



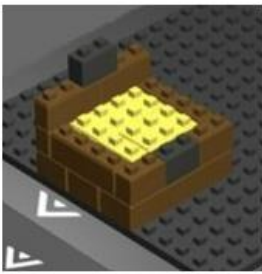
Treasure Chest 1



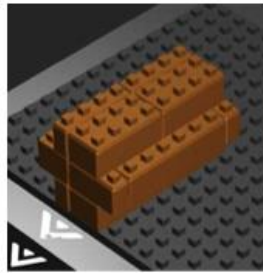
Bowl 1



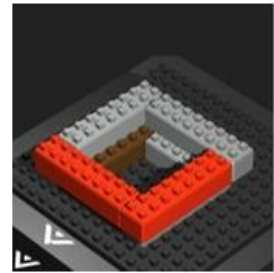
Box 1



Treasure Chest 2



Barrel



Bowl 2

Figure 5. Images of the models in Pirates Day 2



Week 3: Explorers

Day 1

Video (2 min): Show the children the following video: <https://youtu.be/aJ3FS3l0oEc>

Video transcription: *This week you're all explorers. You are about to start a long adventure to find historical objects to be placed in a museum. On the first day, you're going to be building different locations to explore, and on the second day you're going to be building the objects you found and cabinets to keep them in. This is how you can build models out of Lego [shows one model being put together]. You'll find pictures of the models that you need to build in your booklets [shows what the page looks like]. See if you can get your model to look exactly like the one in the picture. Once you have finished a model, tick it off in your booklet and move on to the next one. There are lots of models so you might not have time to do them all and that is ok. Good luck!*

Construction (20 min, 6 models): Read the following script.

“In your books you'll find a picture of each **location** that you need to build. On the left side, there will be a picture of the finished **location**. The picture on the right will help you work out where to put each brick in order to make the right **location**. Complete them in the order they are in your books. When you're done, check your **location** against the picture to see if they match up. Try to make the location look exactly like the one in the picture. Once you have tried to build a model, remember to tick it off in your booklet.”

If children finish early, there is a page at the back of their booklets they can use to draw a picture on or they can play with the Lego. Encourage children to draw/build something related to the theme (explorers).



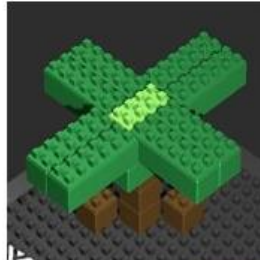
Tidy up (5 mins).

Remind children to:

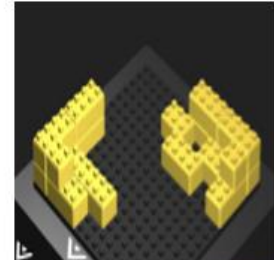
- Tick off all the models they attempted,
- Pack away their Lego bricks into their Lego Tray – all models will need to be broken down to fit in.



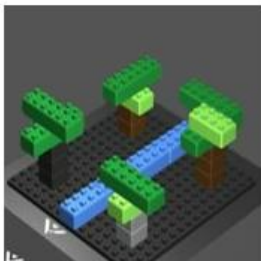
Under-water 1



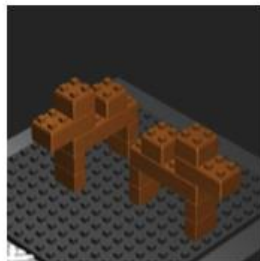
Jungle 1



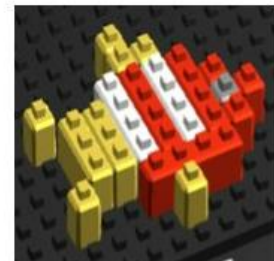
Desert 1



Jungle 2



Desert 2



Under-water 2

Figure 6. Images of the models in Explorers Day 1



Week 3: Explorers

Day 2

Video (2 min): (Same as Day 1) <https://youtu.be/aJ3FS3IOoEc>

Construction (20 min, 6 models): Read the following script.

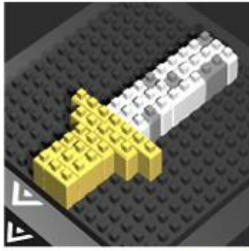
“In your books you’ll find a picture of each **object or cabinet** that you need to build. On the left side, there will be a picture of the finished **object**. The picture on the right will help you work out where to put each brick in order to make the right **object**. Complete them in the order they are in your books. When you’re done, check your **object** against the picture to see if they match up. Try to make the **object** look exactly like the one in the picture. Once you have tried to build a model, remember to tick it off in your booklet.”

If children finish early, there is a page at the back of their booklets they can use to draw a picture on or they can play with the Lego. Encourage children to draw/build something related to the theme (explorers).

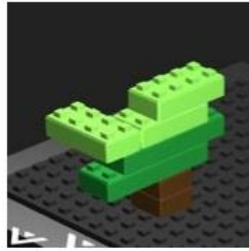
Tidy up (5 mins).

Remind children to:

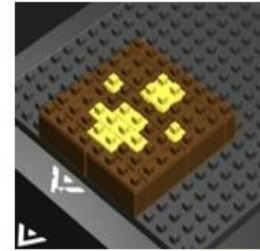
- Tick off all the models they attempted,
- Pack away their Lego bricks into their Lego Tray – all models will need to be broken down to fit in.



Sword



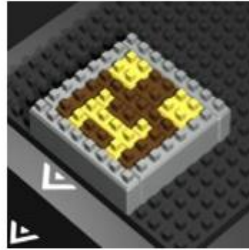
Tree 2



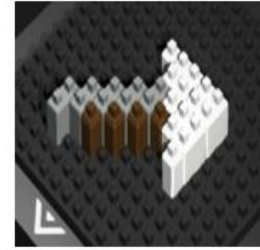
Fossil 1



Spear 1



Fossil 2



Spear 2

Figure 7. Images of the models in Explorers Day 2



Week 4: Aliens

Day 1

Video (2 min): Show the children the following video: <https://youtu.be/N9LyFUV3puo>

Video transcription: *This week's theme is Aliens! An alien spaceship has just landed on Earth. The aliens are really hungry, and their spaceship has broken down. On the first day, you're going to be building food for them, and on the second day, you're going to be building the parts they need for them to fix their spaceship and to fly back home. This is how you can build models out of Lego [shows one model being put together]. You'll find pictures of the models that you need to build in your booklets [shows what the page looks like]. See if you can get your model to look exactly like the one in the picture. Once you have finished a model, tick it off in your booklet and move on to the next one. There are lots of models so you might not have time to do them all and that is ok. Good luck!*

Construction (20 min, 6 models): Read the following script.

“In your books you'll find a picture of each **alien food** that you need to build. On the left side, there will be a picture of the finished **alien food**. The picture on the right will help you work out where to put each brick in order to make the right **alien food**. Complete them in the order they are in your books. When you're done, check your **alien food** against the picture to see if they match up. Try to make the **alien food** look exactly like the one in the picture. Once you have tried to build a model, remember to tick it off in your booklet.”

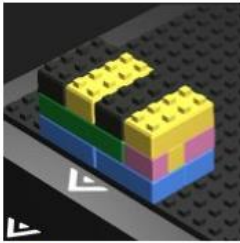
If children finish early, there is a page at the back of their booklets they can use to draw a picture on or they can play with the Lego. Encourage children to draw/build something related to the theme (aliens).



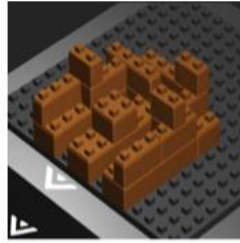
Tidy up (5 mins):

Remind children to:

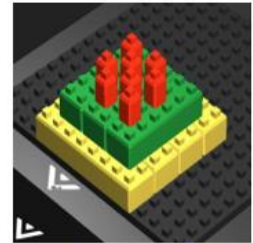
- Tick off all the models they attempted,
- Pack away their Lego bricks into their Lego Tray – all models will need to be broken down to fit in.



Alien Sweets



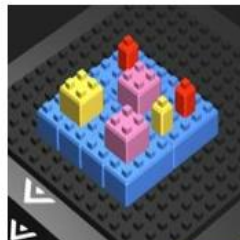
Alien Chocolate Cake



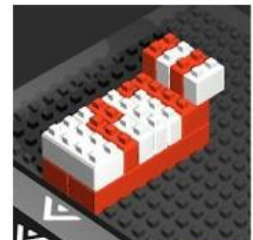
Alien Birthday Cake



Alien Vegetable



Alien Pizza



Alien Candy Cane

Figure 8. Images of the models in Aliens Day 1



Week 4: Aliens

Day 2

Video (2 min): (same as Day 1) <https://youtu.be/N9LyFUV3puo>

Construction (20 min, 6 models): Read the following script.

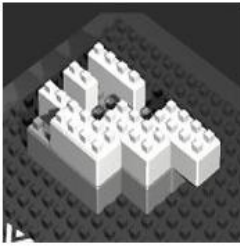
“In your books you’ll find a picture of each **spaceship part** that you need to build. On the left side, there will be a picture of the finished **spaceship part**. The picture on the right will help you work out where to put each brick in order to make the right **spaceship part**. Complete them in the order they are in your books. When you’re done, check your **spaceship part** against the picture to see if they match up. Try to make the **spaceship part** look exactly like the one in the picture. Once you have tried to build a model, remember to tick it off in your booklet.”

If children finish early, there is a page at the back of their booklets they can use to draw a picture on or they can play with the Lego. Encourage children to draw/build something related to the theme (aliens).

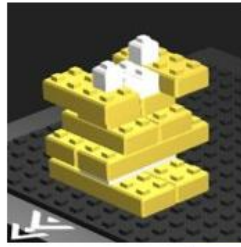
Tidy up (5 mins).

Remind children to:

- Tick off all the models they attempted,
- Pack away their Lego bricks into their Lego Tray – all models will need to be broken down to fit in.



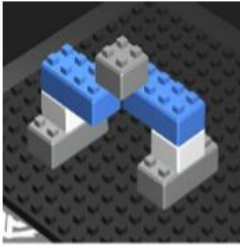
Wing 1



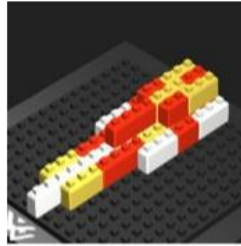
Light 1



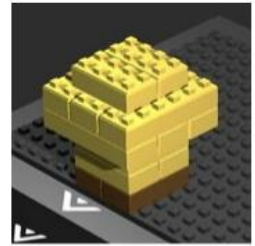
Engine



Satellite



Wing 2



Light 2

Figure 9. Images of models in Aliens Day 2



Week 5: Superheroes

Day 1

Video (2 min): Show the children the following video: <https://youtu.be/9CtqrLQuP64>

Video transcription: *This week you are all superheroes! You need to save the planet from enemies who want to take over the world! On the first day, you will be building some important equipment to use to save the world, and on the second day you will be building the cities you are going to save! This is how you can build models out of Lego [shows one model being put together]. You'll find pictures of the models that you need to build in your booklets [shows what the page looks like]. See if you can get your model to look exactly like the one in the picture. Once you have finished a model, tick it off in your booklet and move on to the next one. There are lots of model so you might not have time to do them all and that is ok. Good luck!*

Construction (20 min, 6 models): Read the following script.

“In your books you’ll find a picture of each **piece of equipment** that you need to build. On the left side, there will be a picture of the finished **piece of equipment**. The picture on the right will help you work out where to put each brick in order to make the right **piece of equipment**. Complete them in the order they are in your books. When you’re done, check your **piece of equipment** against the picture to see if they match up. Try to make the **piece of equipment** look exactly like the one in the picture. Once you have tried to build a model, remember to tick it off in your booklet.”

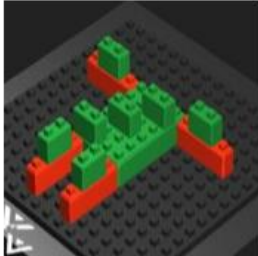
If children finish early, there is a page at the back of their booklets they can use to draw a picture on or they can play with the Lego. Encourage children to draw/build something related to the theme (superheroes).



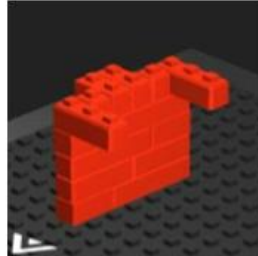
Tidy up (5 mins).

Remind children to:

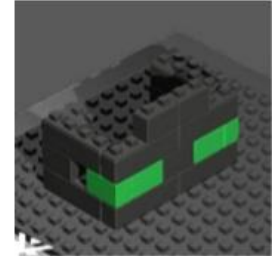
- Tick off all the models they attempted,
- Pack away their Lego bricks into their Lego Tray – all models will need to be broken down to fit in.



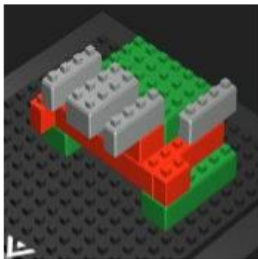
Superhero Suit



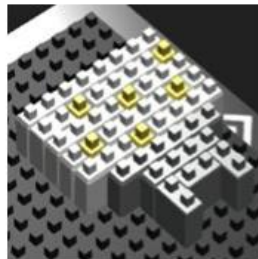
Cape 1



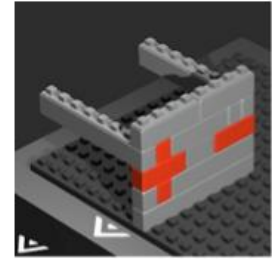
X-Ray Goggles 1



Gadget



Cape 2



X-Ray Goggles 2

Figure 10. Images of models in Superheroes Day 1



Week 5: Superheroes

Day 2

Video (2 min): (same as Day 1) <https://youtu.be/9CtqrLQuP64>

Construction (20 min, 6 models): Read the following script.

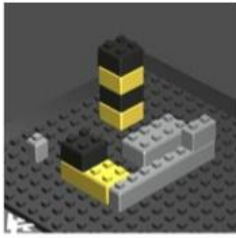
“In your books you’ll find a picture of each **city** that you need to build. On the left side, there will be a picture of the finished **city**. The picture on the right will help you work out where to put each brick in order to make the right **city**. Complete them in the order they are in your books. When you’re done, check your **city** against the picture to see if they match up. Try to make the **city** look exactly like the one in the picture. Once you have tried to build a model, remember to tick it off in your booklet.”

If children finish early, there is a page at the back of their booklets they can use to draw a picture on or they can play with the Lego. Encourage children to draw/build something related to the theme (superheroes).

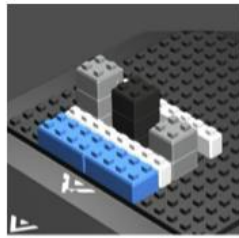
Tidy up (5 mins).

Remind children to:

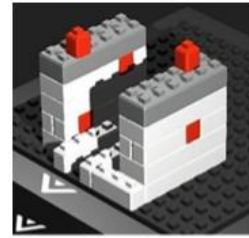
- Tick off all the models they attempted,
- Pack away their Lego bricks into their Lego Tray – all models will need to be broken down to fit in.



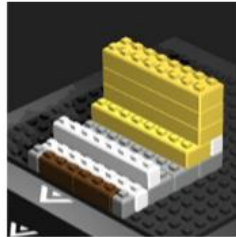
Gotham



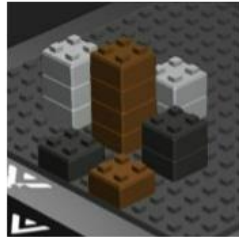
Metropolis



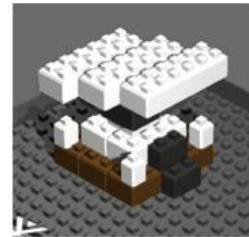
Doc Town



Farmville



Block City



The Quirky Square

Figure 11. Images of models in Superheroes Day 2



Week 6: Spies

Day 1

Video (2 min): show the children the following video: https://youtu.be/chwUzX8_y7Q

Video transcription: *This week you are all going to be spies! You have been given a task which requires you to spy on an evil villain who the Secret Service believes is planning to steal some very valuable things. On the first day, you will be building items to help you to spy on the villain, and in the second day you will be building the items that you saved! This is how you can build models out of Lego [shows one model being put together]. You'll find pictures of the models that you need to build in your booklets [shows what the page looks like]. See if you can get your model to look exactly like the one in the picture. Once you have finished a model, tick it off in your booklet and move on to the next one. There are lots of models so you might not have time to do them all and that is ok. Good luck!*

Construction (20 min, 6 models): Read the following script.

“In your books you’ll find a picture of the **spy equipment** that you need to build. On the left side, there will be a picture of the finished **spy equipment**. The picture on the right will help you work out where to put each brick in order to make the right **spy equipment**. Complete them in the order they are in your books. When you’re done, check your **spy equipment** against the picture to see if they match up. Try to make the **spy equipment** look exactly like the one in the picture. Once you have tried to build a model, remember to tick it off in your booklet.”

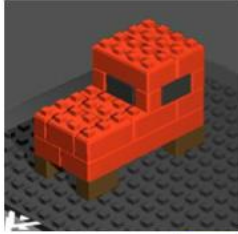
If children finish early, there is a page at the back of their booklets they can use to draw a picture on or they can play with the Lego. Encourage children to draw/build something related to the theme (spies).



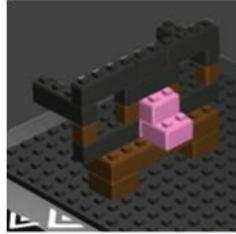
Tidy up (5 mins).

Remind children to:

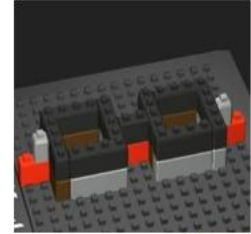
- Tick off all the models they attempted,
- Pack away their Lego bricks into their Lego Tray – all models will need to be broken down to fit in.



Car 1



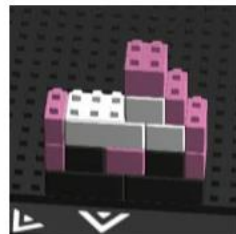
Disguise 1



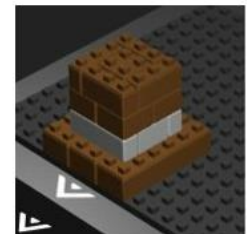
Binoculars 1



Binoculars 2



Car 2



Disguise 2

Figure 12. Images of models in Spies Day 1



Week 6: Spies

Day 2

Video (2 min): (same as Day 1) https://youtu.be/chwUzX8_y7Q

Construction (20 min, 6 models): Read the following script.

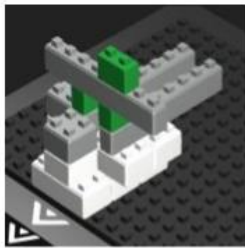
“In your books you’ll find a picture of each of the **stolen items that the spies stopped the thieves taking** that you need to build. On the left side, there will be a picture of the finished **item**. The picture on the right will help you work out where to put each brick in order to make the right **item**. Complete them in the order they are in your books. When you’re done, check your **items** against the picture to see if they match up. Try to make the **items** look exactly like the one in the picture. Once you have tried to build a model, remember to tick it off in your booklet.”

If children finish early, there is a page at the back of their booklets they can use to draw a picture on or they can play with the Lego. Encourage children to draw/build something related to the theme (spies).

Tidy up (5 mins).

Remind children to:

- Tick off all the models they attempted,
- Pack away their Lego bricks into their Lego Tray – all models will need to be broken down to fit in.



Sculpture 1



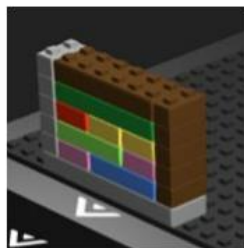
Medal 1



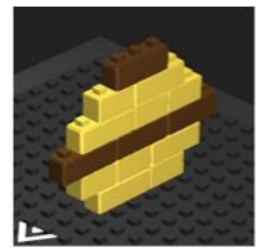
Valuable Art 1



Sculpture 2

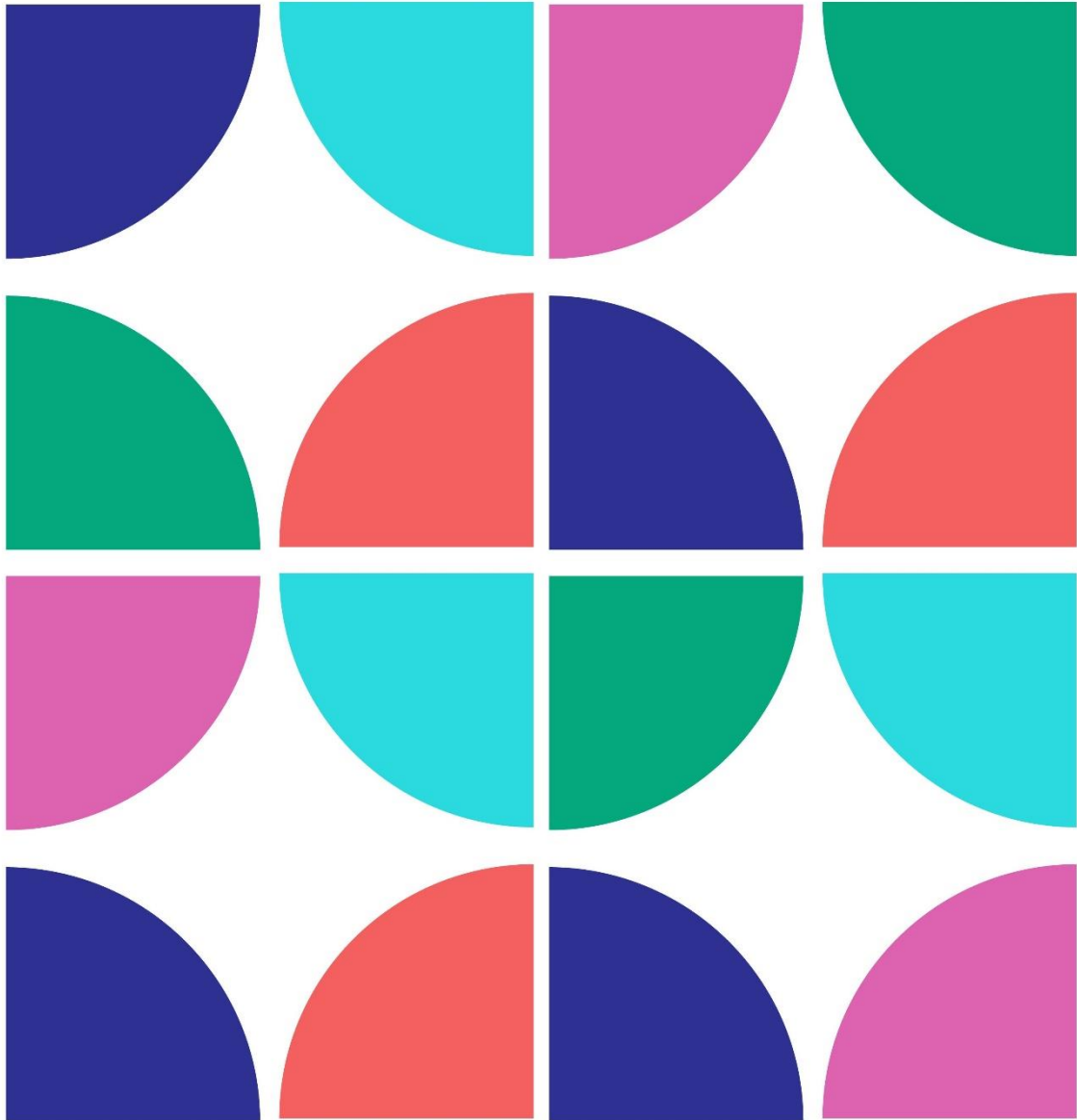


Valuable Art 2



Medal 2

Figure 13. Images of models in Spies Day 2



SPACE