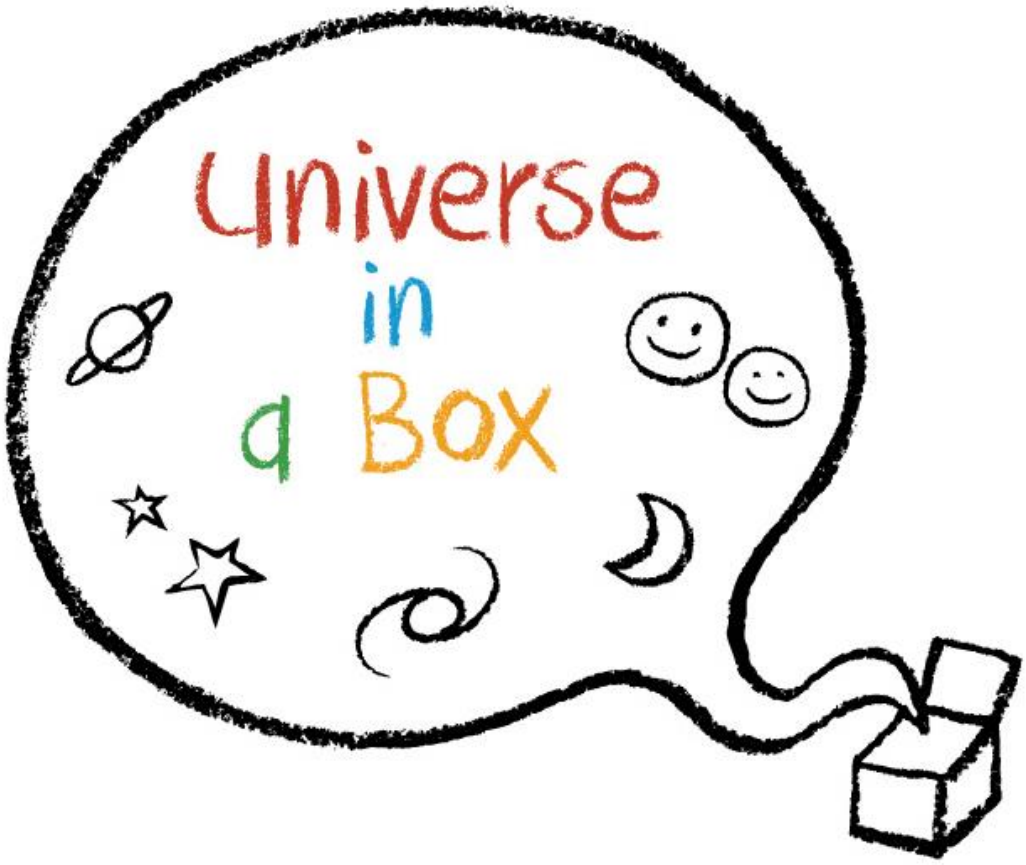


Do-it-Yourself Guide

to making an educational kit that brings astronomy and space sciences to 4–10 year old children across the world

EU UNIVERSE AWARENESS

Contents

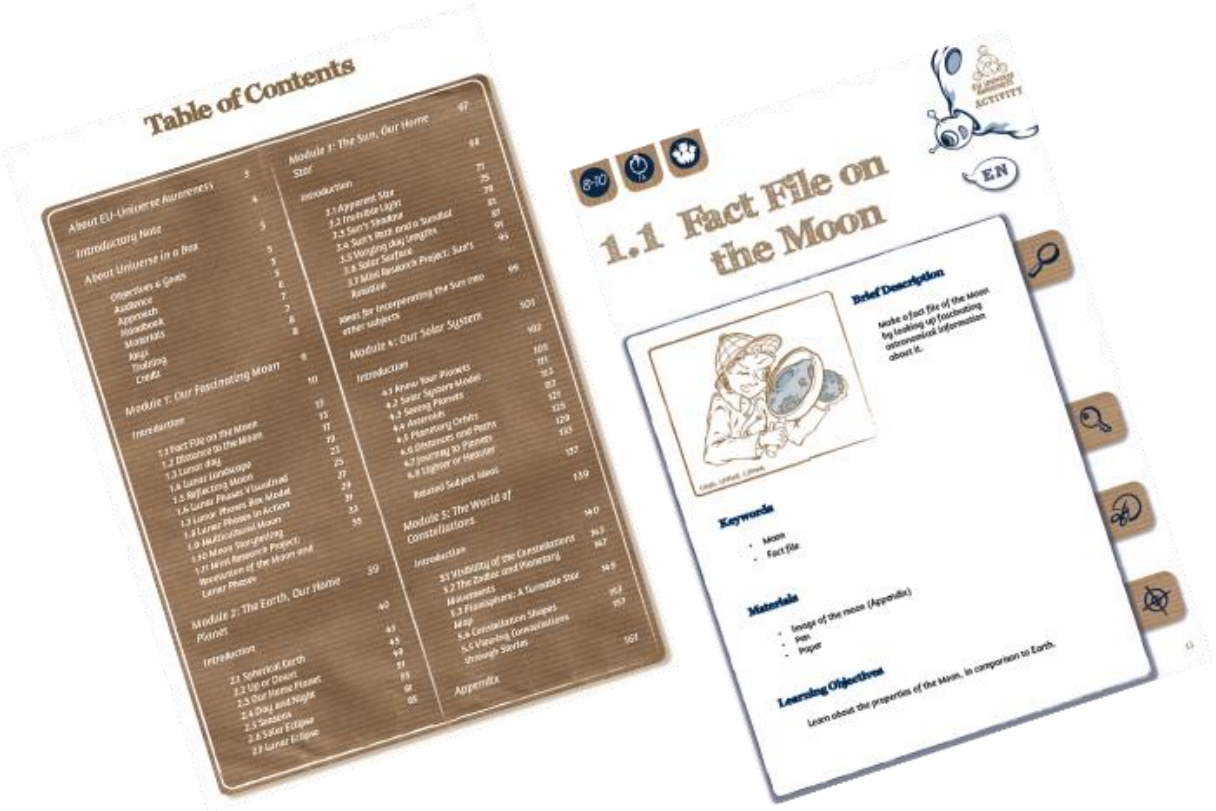
1 Introduction

'Universe in a Box' is an educational kit created to assist teachers and educators in bringing astronomy and spaces sciences to 4–10 year old children around the world. It has been developed to meet a demand for practical, interactive, and fun resources to bring astronomy to the classroom. It provides teachers, parents, and educators with over 40 practical activities across five engaging topics: Our Fascinating Moon; The Earth, Our Home Planet; The Sun, Our Home Star; Our Solar System; and The World of Constellations.

2 Who Is This Guide For?

This guide has been developed for individual teachers, educators, or parents who would like to assemble Universe in a Box for use in the classroom or with their children. It provides details and specifications on the materials that comprise the box, and is supplemented by a Print Package that has all the necessary files needed to reproduce and adapt Universe in a Box for non-commercial use.

3 The Activity Book



The activity book describes over 40 activities for children aged 4 to 10. It is divided into 5 modules and an appendix.

Each module starts with an introduction to the topic, followed by related activities. The activity descriptions present the time required for a particular activity, target age, materials required, learning objectives, background science, activity instructions, connection to the local curriculum and other details.

An updated version of the activity book can be found at EU-UNAWE's educational repository: http://unawe.org/resources/education/Universe_in_Box_activitybook/

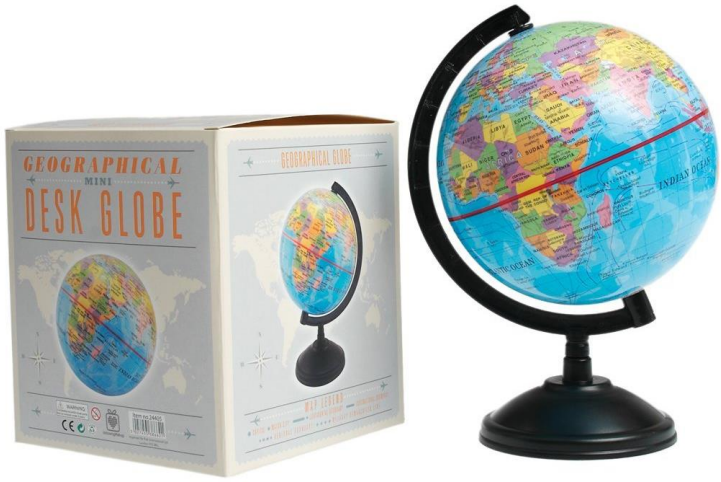
Make a double-sided colour printout of the activity book. Please print the Appendix separately. The images in the moon need to be printed on transparent paper. The sundial base, planet card game, star map, and character figures should be printed on card paper.

All the source files are also available (DOC, PSD, AI and INDD files) for ease of translation in a ZIP file.

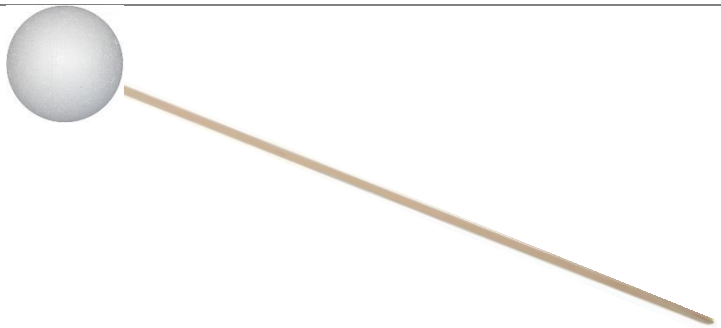
4 The Materials

The list of materials in Universe in a Box is given below. Some common materials used in the activities such as a torch, crayons, and origami paper have not been included in the box and are not present in this list.

The table below lists the item, whether they need to be sourced or handmade, plus a few instructions and comments.

Item	Development	Comments
Modules 1, 2, and 3: Earth-Moon-Sun		
Small globe (15 cm diameter)	Source	 You can source a standard 15 cm globe from your local educational store or online. Look out for recent versions of the globe by checking if the newest countries are marked on them: East Timor (Timor-Leste, 2002), Montenegro (2006), Kosovo (2008), South Sudan (2011). Note: The size of the globe is important because it is in scale to the size of the moon described below.

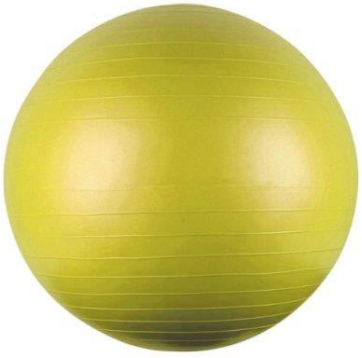
Item	Development	Comments
Reusable adhesive	Source	 A strip of 'Blue Tack' or a suitable alternative should be purchased and added into the box. One strip is 10 to 12 cm long.
Small boat	Make	 Make a small boat out of origami paper. Instructions on how to make the boat are given in the Appendix (Origami Boat) of the activity book. The boat should be about 4 cm wide.

Item	Development	Comments
Light stand and bulb	Source / Make	 A lamp stand should be sourced from your neighbourhood lamp shop. IKEA has a suitable one: http://www.ikea.com/gb/en/catalog/products/50149517/ A warm bulb of 40 W (minimum 20 W) should be used. We recommend using an energy saving bulb.
Styrofoam moon (4 cm) + wooden stick	Source	 Styrofoam is a suitable material for the moon. Balls of standard sizes are usually available in your local craft shop. A 4 cm Moon ball is of relative size to the 15 cm Earth globe. The Earth to Moon diameter ratio is 1:3.67. The length of the wooden stick should be about 25 cm. It should also be available at your local craft store.

Item	Development	Comments
Moon and 3Earth masks	Make – Print Package\01 Earth and Moon Masks	 1. Source two paper plates (10 inches) 2. Make A4 printouts of the Moon and the Earth on sticker paper 3. Neatly cut out the Earth and Moon (8 inches) spheres from the stickers 4. Stick them onto the paper plates 5. Cut secure holes on the sides to tie an elastic band for the masks 6. Please punch out the eyes, nose and mouth as indicated.
Phases of the moon images	Make – Print Package\02 Phases of the Moon	 Print the six images on an A4 matt card paper. Cut them out neatly and laminate the six images individually.

Item	Development	Comments
Moon flip book	Make – Print Package\03 Moon Flip Book	  Print the images of the moon phases on two A3 matt card sheets. Cut out the phases and assemble them into a book following the numbers. Use a large paper clip to clip one side so that you can flip the other and watch the moon change its phases.

Module 4: Our Solar System

Thick string	Source	 Source a 2.5 m, bright yellow or red string. The colour should be easily visible against a dark background.
Solar system model (Sun and planets)	Source / Make	1. For the Sun, source a 100-cm yellow gym / fitness ball (Yellow colour):  This should be available at your local fitness shop or online. 2. The planets can be made from wooden balls (maple or beech wood), usually available in standard sizes from your local craft store:

Item	Development	Comments
		

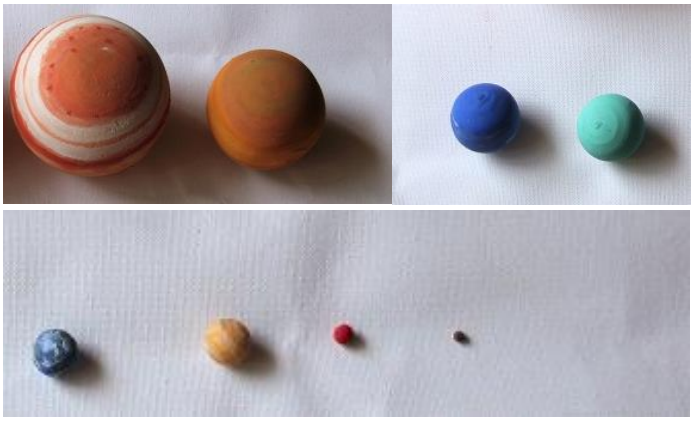
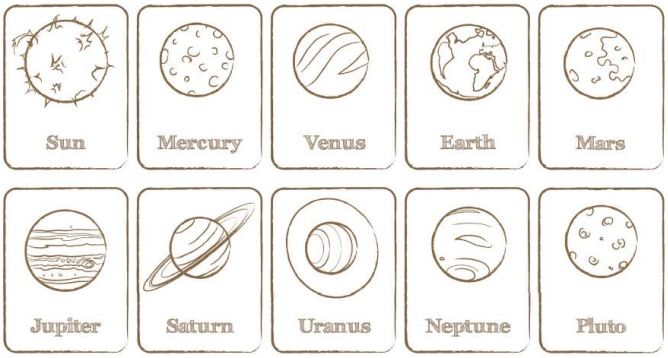
Object	Diameter (in mm)
Mercury	3.5
Venus	10
Earth	10
Mars	5
Jupiter	100
Saturn	85
Uranus	35
Neptune	35

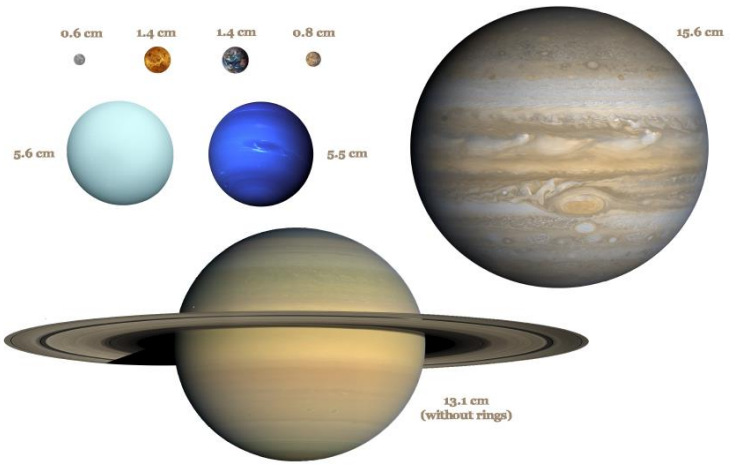
Don't forget to add Saturn's ring. You can cut it out of a transparent plastic sheet: Outer diameter: 130 cm; Inner diameter: 85 mm cm.

The activities also need a wooden Sun of 150 mm diameter.

Note: The four gas planets (Jupiter, Saturn, Uranus and Neptune) can also be made from Styrofoam balls (instead of wood) of the same dimensions given above.

Painting set	Source	Use an acrylic paint set with 6 to 12 colours to paint the wooden balls with the planets' surface details.

Item	Development	Comments
		 An example of the planets painted: 
Planet card game	Make – Print Package\04 Planet Cards Use INDD files for translation.	 Print the two sheets back to front on A4 matt card paper. Cut out the cards and laminate them for durability.

Item	Development	Comments
Planet images	Make – Print Package\05 Planet Images	

1. Print the planet images on one A3 matt card paper. Cut the planets out neatly and laminate them for durability.

   The scale dimensions of the planets are:

Object	Diameter (in cm)
Mercury	0.53
Venus	1.3
Earth	1.37
Mars	0.73
Jupiter	15.41
Saturn	12.99
Uranus	5.51
Neptune	5.34

2. The diameter of the Sun according to this scale is 150 cm. To have the Sun to scale, source a 150 cm diameter round yellow plastic tablecloth.

Item	Development	Comments
		You can also cut out a large canvas sheet.
Origami rocket	Make	 Make a small rocket out of origami paper. Instructions on how to make the boat are given in the Appendix (Origami Rocket) of the activity book.

Module 5: The World of Constellations

Zodiac band

Make – Print Package\06 Zodiac Band

Use PSD files for translation.

1. First make a band of dimensions 11.5 x 300 cm using black chart paper.
2. Print the stickers to place on the constellation band on sticker paper. Place the stickers at equidistant locations in the following the following order: Aries, Taurus, Gemini, Cancer, Leo, Virgo, Libra, Scorpio, Ophiuchus, Saggitarius, Capricorn, Aquarius, Pisces

Constellation viewer and viewcards

Make – Print Package\07 Constellation Viewer

1. Make a A4 print out of the outline on card paper
2. Paint the back of the card paper black
3. Cut the viewer outline and follow the folds
4. Cut out slits (5.5 cm wide) at the end of the viewer to insert the viewcards.

5. Print the viewcards on three A3 sheets. Cut out the viewcards.
6. Pierce holes into the viewcards, where stars are marked. The holes should be needle sized – one large (1 mm) for the big stars, one small (0.5 mm) for the small stars.
7. The back of the viewcards should also be painted black for best effects.

Loose stars

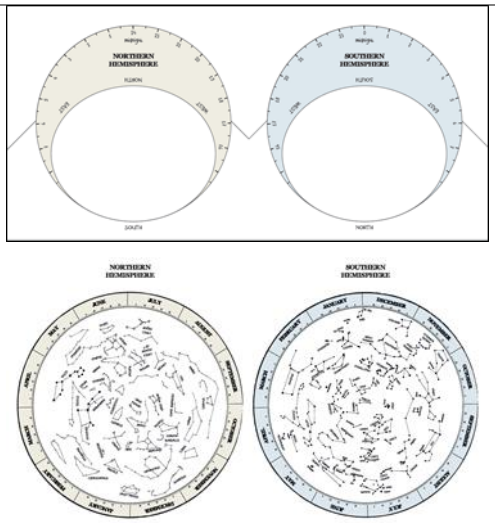
Source

Insert about 15 to 20 loose stars of different colours and sizes in one box. These are usually available at your local craft shop.

Images of the Zodiac

Make – Print Package\08 Images of Zodiac

Make A4 prints of all 12 images with soft lamination

Dark cloth	Source	 Source a dark cloth (black or dark blue) of dimensions 2 x 2 m or 1.5 x 1.5 m.
Planisphere (Turnable star map)	Make – Print Package\09 Planisphere Use INDD files for translation.	 1. Print the star map outside and inside on two A3 card paper sheets 2. Cut along the outline of the star dial and cut the viewport from the centre 3. Cut the two inner circles and stick them back to front 4. Fold the dial and insert the circles within (Northern to Northern and Southern to Southern) 5. Use a centre clip to hold the dial to the star chart.

		Note: The template viewport for the Southern Hemisphere has been set at Brazil, and the template designed for the Northern Hemisphere has been set at Germany. To learn how to cut out a viewport for your country, please visit http://drifted.in/planisphere-app/

Other

File and separator paper for activity book	Source	 The file size should be suitable for A4 paper. Print, punch, and file the activity book.
Big plastic box (30 L)	Source	 The box should be durable depending on its intended use. For one-person use, a strong cardboard box can also be used. The plastic box can be bought at a local store or online. A 30 Litre box is sufficient to fit the material.

Stickers	Make – Print Package\10 Stickers	

Print the Universe in a Box stickers (A4) and stick it to the top and sides of the box. Cut the sticker to size. The sticker should be printed on transparent paper.

5 Reach Out

Please direct enquiries to Jaya Ramchandani (Project Manager, Universe in a Box) by email at jayar@strw.leidenuniv.nl.

If you've assembled Universe in a Box using this DIY guide, please do share your experience with us by writing to us.

Appendix: Checklist

Make about three to four print outs of this checklist to use at different stages of the process (e.g., for a completeness check or price list).

Item	Comments
Small globe (15 cm diameter)	
Reusable adhesive	
Small boat	
Light stand and bulb	
Styrofoam moon (4 cm) + wooden stick	
Moon and Earth masks	
Phases of the moon images	
Phases of the moon flip book	
Thick string	
Solar system model (sun and planets)	
Stability ball sun	
Painting set	
Planet card game	
Planet images and plastic/canvas sun	
Origami rocket	
Zodiac band	
Constellation viewer and time cards	
Loose stars	
Images of the Zodiac	
Blue cloth	
Star map	
File for activity book	
Big plastic box (30 Litre)	
Stickers	
Activity book	