

## Taking a photo with SPIRIT- Beginner Module

### Program overview

Lessons required – 2

In this sequence of lessons students will choose deep space objects and photograph them using the [SPIRIT telescopes](#)

There are many other possible add on lessons, see extra activities listed in each lesson.

This program fits into the year 7-10 Science and Digital Technologies curriculums. It is designed to develop STEM skills through open-ended and real life experience.

### Skills focus:

- Understanding celestial coordinates and the meridian line
- Choosing an appropriate deep space object to view
- Coding (optional- only if using live viewing)
- STEM skills
  - Problem solving
  - Critical analysis
  - Independent thinking
  - Digital literacy

### Required resources:

Device (laptop, computer) with internet access

Stellarium – (free software) <http://stellarium.org>

A FTP program (recommended free software Filezilla <https://filezilla-project.org>)

FITS liberator – (free software)

<https://noirlab.edu/public/products/fitsliberator/>

### If you are choosing to process your images:

Photoshop or a free photo processing software such as GIMP

### Curriculum links:

#### Science

Energy transfer through different mediums can be explained using wave and particle models (ACSSU182) **Year 9**

The universe contains features including galaxies, stars and solar systems, and the Big Bang theory can be used to explain the origin of the universe (ACSSU188) **Year 10**

**Science Inquiry Skills – year 7-10**

- Questioning and Predicting
- Planning and Conducting
- Processing and Analysing Data and Information
- Evaluating
- Communicating

**Digital Technologies – year 7 – 10**

- Collecting, managing and analysing data
- Digital implementation
- Creating solutions

**General capabilities:**

Numeracy

ICT capabilities

Critical and creative thinking

**Lesson 1 (60 minutes)**

**Prerequisites:**

- Internet connected laptop or computer for students
- Stellarium downloaded
- Celestial Object Stellarium Information worksheet photocopied

**Questioning and Predicting:**

1. Introduce students to celestial coordinates. Information found [here](#). A helpful video: <https://www.youtube.com/watch?v=WvXTUcYVXzI>
2. Introduce magnitude of celestial objects and what it means. Information can be found [here](#).
3. Students practice using Stellarium by filling out the *Celestial Object- Stellarium Information* worksheet individually or in groups. More information on how to use Stellarium and set up the correct place, date and time can be found [here](#).
4. With the information they have gathered so far, students should write a question or a hypothesis on a post it note about what they want to use the telescopes for. E.g. What is the difference between a galaxy and a nebula? What is the best exposure time for an object with a magnitude of 14 or more?

- Investigation planner photocopied

Teachers may want to familiarise themselves with the Stellarium program before using in class.

Teachers need to choose between live viewing, scheduling or a mixture of both.

**Planning and Conducting:**

5. Once students are comfortable using Stellarium, use their questions or predictions from the last step, to begin finding deep space objects they want to view. Use the *investigation planner* to set any parameters of the objects they can view.

Using the parameters students can choose a number of objects to view using Stellarium.

Tips on how to choose an object can be found [here](#) and exposure information can be found [here](#).

6. Individually or in groups, students fill out the investigation planner. Encourage students to try different types of exposures, filters etc or to take their images on more than one telescope so there is a range to compare and choose from.

7. Use [SPIRIT](#) to get images by:

a) *Live viewing-* If you are using live viewing and would like students to create a plan to practice their coding skills use the information [here](#).

**Please note: If using live viewing teachers need to book the appropriate time on [SPIRIT 2](#). Students or teachers will need to log in at the requested time to complete their [viewing plan](#) and [live viewing](#).**

b) *Scheduling-* If you are using the scheduler then students should follow the instructions [here](#).

**Please note: Students or teachers will need to include an email address in the schedule browser section of the web interface to make sure they get notified when the images are ready.**

**Extra activities:**

a) Science as a Human Endeavour- Investigate the Scientists behind the astronomical catalogues. A good place to start would be Charles Messier behind the Messier Catalogue or the contribution of the Herschel siblings to the New General Catalogue.

b) Compare and contrast – Use the SPIRIT telescope information sheet to compare and contrast the features of the different telescopes. This can also be useful when deciding which telescope to image with.

<p><b>Lesson 2 (60 minutes)</b></p> <p><b>Prerequisites:</b></p> <ul style="list-style-type: none"> <li>• FTP software</li> <li>• If compiling images- a photo editing software such as photoshop or GIMP</li> </ul> <p>If using SPIRIT 4 and 6, teachers will need to ensure that the photos have been taken by checking the scheduler (don't forget to input email addresses so you get a notification when the images are ready)</p>	<p><b>Processing and analysing data and information:</b></p> <ol style="list-style-type: none"> <li>1. Students should use FTP to access their images. Instructions on how to use Filezilla are found <a href="#">here</a>. <i>If you are composing a colour image use the instructions <a href="#">here</a> for photoshop. GIMP is also an option for free software.</i></li> </ol> <p><b>Evaluating:</b></p> <ol style="list-style-type: none"> <li>2. Once the images are accessed or compiled, ask students to rate their images using the <i>SPIRIT image evaluation form, SPIRIT investigation planner</i> or both. Focus on critical thinking and ideas on how to improve their imaging. They may ask group members or other peers for feedback. <i>If there is time in your program, students can use the opportunity to reimage their object with the changes. Again, encourage them to experiment with exposure times and filters to see what gives the best outcome.</i></li> <li>3. Examine the pictures for features such as constellations, colours, clouds of gas or anything else that may be of interest.</li> <li>4. Watch this video to explain the way the SPIRIT filters work and what colours in space mean: <a href="https://www.youtube.com/watch?v=WSG0MnmUsEY">https://www.youtube.com/watch?v=WSG0MnmUsEY</a></li> </ol> <p><b>Communicating:</b></p> <p>At the teacher's discretion students can publish their photos for the wider astronomy community. Some places to do so are:</p> <p>ICRAR's SPIRIT photo of the year competition (watch <a href="http://icrar.org/spirit">icrar.org/spirit</a> for more information)</p> <p>Astrofest Astrophotography exhibition and competition (watch <a href="http://www.icrar.org">www.icrar.org</a> for more information)</p> <p>Astronomy.com's community gallery (<a href="http://cs.astronomy.com/asy/m/default.aspx">http://cs.astronomy.com/asy/m/default.aspx</a> )</p> <p>NASA's Astronomy Picture of the Day website (<a href="https://apod.nasa.gov/apod/lib/aposubmit2015.html">https://apod.nasa.gov/apod/lib/aposubmit2015.html</a> )</p> <p><b>Extra activities:</b></p> <ol style="list-style-type: none"> <li>a) Continue on with the SPIRIT programs. You may want to move to an intermediate or advanced program.</li> <li>b) For more citizen science opportunities visit <a href="https://www.icrar.org/outreach-education/outreach-initiatives/citizen-science/">https://www.icrar.org/outreach-education/outreach-initiatives/citizen-science/</a></li> </ol>
<p><b>What next:</b> Now that your students are familiar with the SPIRIT program you may want to continue with a research project. If you are looking for ideas or support on how to use SPIRIT in your classroom, please contact us at any time at: <a href="mailto:spirit@icrar.org">spirit@icrar.org</a></p>	