

Guidance of " Let's watch Jupiter!"

1. Background

One of the features of the Jupiter is having a lot of satellites and 63 satellites are found now (July, 2008). It was Galileo Galilei that discovered the satellite around Jupiter for the first time. He did the celestial observation that used the telescope for the first time ever in 1609, and in next year, he discovered four heavenly bodies around Jupiter. This discovery is a counterpart of miniature version of solar system thought about by the Copernican theory; another heavenly body turns round surroundings of one heavenly body. At that time, it was not clarified that whether the Copernican theory or the Ptolemaic theory was correct. However, Galileo's important discovery supported the Copernican theory. These four satellites are being called now Galilean satellites. The name such as Io, Europa, Ganymede, and Callisto is given to Galilean satellites in order near Jupiter.

2. Aim

The aim of this activity is that children also feel the surprise and impression similar to Galileo through his reliving. It is important to work and discovered satellites by the power of children as much as possible. Therefore, the assistance of adult should be a minimum.

3. Knack of observation

It might be difficult for the start to put the Jupiter in view, and to set the focus. **It is important to use tripod that can be firmly fixed.** When the Jupiter enters view, let's fix the telescope at once, and focus the telescope afterwards. Moreover, it is also important to practice by using distant scenery in daytime.

4. Flow of activity

A) Observation and sketch

Let's do the observation and the sketch three times by using the work-sheet of the first page. First and second observation should be done on the same day and there should be the interval of one hour or more between them. The change of the satellite's position could be noticed according to the position of satellite. However, some satellite's movement is small, and it will be difficult to notice the change of the position by the same day's observation. Then, let's do the third times on a different day. In the third observation, it can be understood that there are 3 or four stars near Jupiter, and the

position has changed obviously compared with the sketch of the previous state.

If children have a motivation, you can increase the sketch column, and recommend to children to observe as a lot as possible though there are only three columns on work-sheet.

B) Write what is noticed, and doubted

Let's write what is noticed and doubted through the sketch under the sketch column.

C) Guess that they are moons of Jupiter by the sketch and the photograph

In the second page of the work-sheet, there is a photograph of Jupiter and satellite that was taken at every alternate hour. From that photograph and the sketch, it can be noticed the heavenly body always exist around Jupiter, and they moves regularly.

D) Confirm how the Jupiter satellite looks from the earth

Through doing work, let's understand how to see moons of Jupiter from the earth by using the third page of the work-sheet. Write the arrows like the example of Ganymede, and confirmed movement of satellite is the same as actual observation result.

E) Write what is understood today, and what you want to know more

As a summary, let's write what is understood today like "There are three or more satellites around Jupiter, and from the earth, they looks moving near Jupiter" etc. In addition, let's write what is wanted to know in the future as well. Those who support children should encourage them by supplementing and supporting with these contents and children can continue to act with the concern in the future.

5. Notes

As written in "2. Aim", the objective of this activity is that children discovered Jupiter's satellite by themselves. Then, if children do not know the existence of moons of Jupiter, it is better to turn down and execute the satellite of Jupiter.

6.Memo

There are two kinds of the combination of eyepiece and object lens for a refractor: the Galileo style and Kepler style. The Galileo style uses a convex lens for the object lens and a concave lens for the eyepiece. This combination makes an erect image, however the field of view is very narrow. It has been used for opera glasses with a low magnification today. Meanwhile the Kepler style uses the convex lenses for the object lens and the eyepiece. It was made by Johannes Kepler. With this combination, an inverted image appears, but the field of view is relatively wide. It has been used for observations of celestial objects. Please try to guide the children's interest towards the history of telescope and its optical system through experience obtained with telescopes of the Kepler and Galileo styles.