

With Covid-19: Attempt of learning to observe the moon using a telescope at home

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Abstract. Students took an assembly-type telescope kit from a public elementary school and brought it to their homes in 2019. Three classes attempted to observe the Moon at home using the Kaifu-NAOJ Telescope Kit. As a result, all children observed the Moon at home using the kit. From their observations, around 90% identified the existence of craters and understood the reflection of sunlight on the Moon's surface. As Covid-19 prevention measures in education, we propose the introduction of at-home telescopic observations for STEAM activities.

Keywords. telescope, Moon, sociology of astronomy, Active Learning, STEAM

1. Introduction

Nowadays, STEAM education and Active Learning are in demand in schools. However, it is generally difficult to conduct evening and nighttime astronomical observation sessions at schools for the following reasons. (1) Ensuring the safety of children and students when they return home, (2) Faculty work time management, (3) How students spend their time after school, and (4) from the viewpoint of COVID-19 prophylaxis, there is a risk of infection at the viewing events, which are prone to contact infection and high concentrations of COVID-19. In this study, we investigate whether it is possible for each student to bring home an astronomical telescope kit developed by NAOJ and observe stars at home (Agata 2020).

2. Tools and methods

NAOJ has provided star observing workshop using Kifu-NAOJ telescope kit (NAOJ 2020) since 2019, which was developed as a ready-to-assembled telescope with reasonable price for an educational tool. (Fig. 1).

Active learning workshop was conducted in Shimauchi Elementary School with Mr. Teruyoshi Takizawa as a teacher in charge in the course of the unit "Moon and Sun" in 6th Grade Science using Kaifu-NAOJ telescope kit, which was rent out by NAOJ for 8 days. The unit includes 7 school hours (45min/school hour) and the workshop was held from October 29th to December 6 th, 2019 in three classes. The theme of the workshop was the "What's on the surface of the moon?" Each student was provided their own telescope kit, and a tripod if he/she needed. Students assembled the telescope and learned how to bring the telescope into focus in class (Fig. 2) and they took it home to observe the moon according to instructions on the worksheet. We investigated and evaluated its learning effectiveness using learning cards, questionnaires, and other tools.



Objective lens	Diameter 50 mm Focal length 399 mm Two achromatic lenses
Magnification	16x and 66x (replaceable eyepieces)
Full length	450 mm (about 490 mm at maximum extension)
Maximum diameter	67 mm (excluding protrusions)
Weight	Approx. 265 g
Eye pieces	25 mm (Huygens type) 6 mm (Plössl type)

Figure 1. Kaifu-NAOJ Telescope Kit before and after assembly and its specifications.



Figure 2. Students are assembling the telescope (left) and bringing it into focus (right).

70 students in class A and B were examined before and after observation at home to compare the proficiency while 35 students in class C as a reference group were examined only before observation.

3. Results and implication

All students in class A and B were able to observe the moon at home using the kit although some students (about 20%) needed support. After observation, more than 90% of them understood the existence of craters and nearly 90% of them understood that the moon shines due to the reflection of sunlight while less than 80% and 80% students did respectively in reference group without observation. In addition to achievement of proficiency, active attitudes to learning also tended to be nourished. Their impressions on observation at home excerpted from the post-questionnaire are as following.

- This was my first time using an astronomical telescope. I am glad that I was able to observe the moon thoroughly and ask many questions. It was a great memory for me to observe the moon in sixth grade science class.

- Observing the moon was the most fun I had in 6th grade science.

- It was fun! It was a rare experience, so it was good. I don't like science much, but it's something I enjoy and like to do, so it was good to see that it was fun. Looking at the moon is hard work, but when I saw it, I felt like I did my best.

Based on this positive results, we would like to propose the introduction of telescopic observation at home into problem-solving active learning in elementary and middle school science from the viewpoint of COVID-19 prevention.

References

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