IMPROVEMENT OF ASTRONOMY COURSE TEACHING BASED ON OBSERVATIONS

Muslimova Yulduz Choriyevna
Candidate of Physical and Mathematical Sciences, Acting as Associate Professor of the "Physics and Teaching Methodology" Department of TSPU named after Nizami

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Abstract. *The article discusses the possibilities of improving the teaching of general astronomy in pedagogical higher educational institutions on the basis of astronomical observations*.

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Today, higher education institutions (HEIs) are paying a lot of attention to improving the quality of teaching general astronomy, introducing modern teaching methods into the educational process, selecting and motivating talented students, as well as developing scientific research and innovations. This was also emphasized in the decision "On measures to improve the quality of education in the field of physics and develop scientific research" adopted by the President on March 19, 2021 [1]. In higher education institutions, which are an integral continuation of general secondary education, the competence to observe, understand and explain astronomical phenomena, the competence to draw conclusions, the competence to use astrophysical knowledge and tools in practice is developed. It is also important to conduct laboratory work, perform virtual laboratory work, and directly observe astronomical phenomena with the help of telescopes in the development of these competencies in students [2,3,4]. For this purpose, students of solar and lunar eclipses, planets, stars and other celestial bodies using their astronomical knowledge, various manuals and tools necessary for observing space objects, astronomical dreams, calendars, star atlases, maps, sky sphere model, telescopes. should be observed together with [5,6]. In the process of conducting each observation, its content, observation methods, necessary literature are shown, and the tasks that the student must perform are determined. As experience shows, observing students exchange ideas, learn to work with star maps, atlases, calendars and reference books made on the basis of scientific observations, to compare luminaries with the conclusions made on the basis of observations [7,8,9]. In order for the student to correctly perform the tasks presented in the observation work, it is necessary to find the necessary information that will be used as a basis for the work in various manuals. Based on the results of observation, students report in the order indicated at the end, and it is appropriate to demand that the given report tables are neat, formulas are concise, calculations are clear, and conclusions are meaningful and short. Observing works from astronomy can be considered as an example of observing the Sun.

Observing the Sun in a telescope. The sun can be observed in a small, even homemade telescope made of glasses. The best instrument for observing the Sun is a reflector telescope with an obstruction reflector. It is advisable to conduct observations in the morning, because during this period the air is relatively calm and therefore the telescope image is more stable. It is possible to observe the sun at noon, but in this case, without taking your eyes off the eyepiece, you have to wait a long time until a good quality image appears. Solar observations can also be carried out in a refractor telescope, if there is no helioscope (special solar eyepiece), then an aperture with a relative aperture of 1/30 to 1/45 should be placed on the refractor lens, otherwise the eyepiece lens will burn. and may crack. Students are instructed to take care of their eyes when observing the Sun, for this they wear a black glass with a neutral protective film on the eyepiece. It is necessary to direct the telescope to the Sun according to the shadow of the tube. The limit of the image caught in the telescope is reduced until the Sun disk is clearly visible, for this purpose, eyepieces with a magnification of 40-60 times are used. A Sunscreen with a sheet of white paper attached to it is used to display telescopic images of the Sun to the public. In this case, the screen is shaded, and if the observation is made in the pavilion, then only the part of the roof where the light falls on the telescope lens is left. In such conditions, the inside of the pavilion will be dark enough and the image of the Sun on the screen will be clearly (detailed). If the telescope does not have a clock mechanism, it is necessary to ensure that the tube of the telescope moves in the same way as the Sun, that is, the image of the Sun on the screen stays in one place (fixed) all the time. The telescope tube should be left stationary for 1-2 minutes to show observers the diurnal parallel direction of the movement of a particular Sunspot. It is possible to determine the position and rotation or direction of the Sun's equator in a certain direction of the diurnal parallel and using the astronomical calendar. The spectrum of the Sun can be formed directly in the field of view using a spectroscope attached to a telescope. It is better to show the solar spectrum preferably by projecting it on a screen and also in a shaded pavilion. Photographing the Sun allows for more efficient observations. Students who are more interested in astronomical observations can devote their free time to systematic observation of Sunspots and flares. However, such observations require a period of up to several months.

In this, the observed image of the Sun is viewed in a telescope with a protective device, and circular templates are made in drawings. In another way, a white sheet of paper with a diameter circle of the required size is placed on the screen and the image of the Sun is projected onto it. After each observation, all spots and flares on the Sun's disk are recorded. If later it is intended to determine the coordinates of the sunspots, then the pictures will show the direction of the parallel diurnal. It is recommended that every image and photo taken with sunspots be enriched with digital images of large spots, groups of spots, or scaled images of these elements. It is advisable to prepare drawings and photographs of individual structures on an enlarged scale if atmospheric conditions allow. Students will need to number each picture or photograph of their observations and write them with brief text notes (date, time, etc.). Thus, students digitize pictures or photographs of the Sun in ascending order for initial processing of all collected observational material. In particular, to determine the Wolff number (W), it is necessary to separately count the number of spots (f) (whether in groups or individually) and the number of groups of spots (g) in each image or photo of the Sun. Then, using the formula $W=10g+f$, the relative number of spots characterizing the spotty activity of the sun is calculated. The results are tabulated. If the observations are continued for a long time, it is possible to obtain the averaged value of the Wolff number for months and years. It is desirable to prepare the results in a graphical form, in which time is placed on the abscissa axis, and the Wolff number is placed on the ordinate axis in a rectangular coordinate system. Observing the Sun can be for various purposes, for example: measuring the visible angular diameter of the Sun from a universal instrument or a stretched thread in the eyepiece of a telescope, and determining its linear diameter. In all cases, a darkened light filter is worn over the eyepiece to protect the eyes. The eyepiece is rotated and fixed in such a way that the diurnal motion of the Sun in the fixed instrument is located along one of the threads. In that case, by determining the times T1 and T2 during the crossing of the vertical thread of the opposite point of the Sun disk from the stopwatch, its angular diameter is found.

$$d' = \frac{T_2 - T_1}{r_1} \cdot \cos\delta,$$

δ - is the deviation of the Sun (taken from the Astronomical calendar - annually), $(T_2 - T_1)$-is expressed in vart seconds, d - is in arc minutes (′). By this method, the angular diameters of the Moon and the planets, or the angular distances between the constituents of a double star, can be measured. Knowing the Sun's horizontal equatorial parallax $p_\odot$ = 8″,794 its linear diameter can be calculated. This task can also be solved by the methods of photographic astronomy, for which a photo camera is installed on the focal plane of the telescope and the lens is closed with a neutral filter of the Hc-So type, and a photo of the Sun is taken on a slide plate. The exposure of the photo is chosen by experiment and it usually lies in the range of 1/100 to 1/500 of a second. The diameter of the image of the Sun on the negative is determined in millimeters on an astronomical measuring instrument (for example, MIR-12). Angular diameter of the Sun in minutes of arc

$$d' = 3438\frac{d}{F},$$

where d- is the linear diameter of the photographic image of the Sun, and F- is the focal length of the telescope lens, expressed in the same measurement units. Observation of the Sun can also be devoted to the study of its sunspots, as shown above. In this case, the image is transferred to a screen attached to the telescope eyepiece for visual observation. A white paper with a circle of 10 cm in diameter is placed on the screen. By focusing the telescope and moving the screen, the most accurate image of the Sun is created, corresponding to the circle drawn on the paper. Then you can count the number of spots and groups by holding the image of the Sun in a circle, or you can draw a picture of a spot on paper with a pencil, and after observing the number of spots, count them according to the picture. This work can also be done using a photo of the Sun, and to use the Sunspot palette in processing, the photo must also be 10 cm in diameter. The report is prepared independently and shown to the teacher. As the student's observational experience and information on the scientific results he receives increases (if they are homogeneous and long-term), it becomes important from a scientific point of view, and it becomes relevant in the development of students' way of thinking and increasing their scientific potential.

Acquaintance with these observational works, directing students to scientific and research work, as a result of observing astronomical phenomena, the competence to understand and explain, the competence to draw conclusions, the competence to use astrophysical knowledge and tools in practice is developed, at the same time, the content of astronomy education and education is developed. improves quality.

REFERENCES

1. Shavkat Mirziyoev., Concept of development of the higher education system of the Republic of Uzbekistan until 2030. Decree No. PF-5847 of October 8, 2019. https://lex.uz/
2. Y. Ch. Muslimova "Improve the teaching of Astrophysics course". "Science and innovation" International Scientific Journal Volume1, Issue 5, UIF-2022:8.2, ISSN:2181-3337

3. S. Daminova, Yu.Ch. Muslimova. Use of Internet technologies in teaching astronomy course. Internauka: electronic. nauchn. Journal. 2021. No. 2(178).
4. Y. Ch. Muslimova Improvement of Astrophysics education based on Internet technologies. "Science and innovation" International Scientific Journal Volume1, Issue 5, UIF-2022:8.2, ISSN:2181-3337
5. Y. Ch. Muslimova, S. Yusupov Observing the planet Venus during circle exercises, "Molodoy issledovatel: vyzovy i perespektivevy" #8(250), Moscow, Izdatelstvo Internauka, 2022
6. Burkhanov, O., & Nurmamatov, S. (2022). Express astrometry of images obtained during astronomical observations using "maxim dl". Science and Innovation, 1(8), 863-870.
7. Nurmamatov, S. (2022). Formation of astronomical concepts in lessons in physics. Science and innovation, 1(B8), 1708-1709.
8. Y. Ch. Muslimova. Important factors in the teaching of modern astrophysics in pedagogical institutions of higher education. Internauka: e-Journal. 2021. No. 1(177).
9. Y. Ch. Muslimova "Creating eco culture during teaching the astronomy course". XVI International scientific and practical conference "Paradigm of modern science and conditions of modernization and innovative development of scientific thinking: theory and practice" April 12-13, 2022, Kostanay str.705-709