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The design and construction of a sundial from a paper model prototype to a 3D printed

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The purpose of this project is to design and build a sundial that can be used for astronomy activities in school. It also helps students practice designing and creating new ideas using astronomy as the main subject.

A sundial is an astronomy tool used to tell time during the day by using the shadow created by sunlight. The shadow falls on the base of the sundial, and we can read the time from the numbers or symbols marked on it. To design a sundial, we need to understand the path of the Sun, called the "ecliptic path," which shows that the Earth's axis is tilted at 23.5° as it moves around the Sun. Students also need to know basic ideas about the celestial sphere.

The Astronomy Club of Piboonbumpen Demonstration School, Burapha University, has developed various types of sundials including Equatorial Sundial, Horizontal Sundial and Polar Sundial, each designed uses based on its unique characteristics. These designs have been adapted into paper models that serve as accessible and easily distributed educational tools. With only basic materials such as pencils, cardboard, erasers, rulers, and glue, any school can create and assemble them on their own. Since students have experimented with making paper model sundials, in addition to giving them knowledge in astronomy and design, which is a part of the engineering, architecture and product design processes, which are complete STEAM EDUCATION activities, it also fosters imagination and helps develop small muscles, which are essential for children. However, paper models still have many limitations that make them unsuitable for use in astronomical activities or projects, such as users being unable to assemble the models correctly according to standards, which may result in inaccurate data when used. Or the paper is not strong enough to be used in outdoor activities in windy or wet areas. Therefore, the creators have developed the clock model to be more suitable for the context of use.

The Astronomy Club of Piboonbumpen Demonstration School, Burapha University has developed a paper sundial models into 3D printed sundial models, which makes these sundials suitable for use in astronomical activities, teaching or real projects. It also trains students in the club to have skills in designing and creating innovations using astronomy as a base.

After students were given the goal to design astronomy tools and make paper models, many of them were able to create sundials that followed correct astronomy principles. Their work showed creativity and could really be used in astronomy activities. These models can also be shared with other schools for learning and teaching.

Primary authors: JAMSAIBUA, Thipa (Piboonbumpen Demonstration School, Burapha University); Ms LAKHAM, Wattanasiri (Piboonbumpen Demonstration School, Burapha University); HENNGAM, Boonsong

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