

# Data Driven Astronomy Education and Public Outreach

Chenzhou CUI<sup>1</sup> and Shanshan LI<sup>2</sup>

<sup>1</sup>National Astronomical Observatories, CAS  
20A Datun Road, Chaoyang District, Beijing, China, 100101  
email: ccz@nao.cas.cn

<sup>2</sup>National Astronomical Observatories, CAS  
20A Datun Road, Chaoyang District, Beijing, China, 100101  
email: lishanshan@nao.cas.cn

**Abstract.** Mega-science astronomical projects such as CTA, DESI, EUCLID, FAST, GAIA, JWST, LAMOST, LSST, SDSS, SKA around the world and large scale astronomical simulations generated massive amounts of data every day. Currently, a large part of these data are designed and used by astronomers, physicists or computing experts. But some people and groups are trying to find ways to use these data for education and public outreach (EPO), because they think these data are valuable resource and perfect material for these uses. As the development of internet, cloud computing and multimedia technology, more projects for education and public outreach based on astronomy data achieved impressive results, like *zooniverse*, *WorldWide Telescope* (WWT). Try to connect people and groups working under this concept, IAU Inter-Commission B2-C1-C2 working group Data-driven Astronomy Education and Public Outreach (DAEPO) was launched officially in April 2017. The major objectives of DAEPO is to act as a forum to discuss the value of astronomy data in EPO, to show advantages and benefits of data driven EPO, and the challenges facing to data driven EPO.

**Keywords.** Astronomical data, Astronomy education, Public outreach, WWT

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Every day, giant telescopes around the world like Global Astrometric Interferometer for Astrophysics (GAIA), Sloan Digital Sky Survey (SDSS) and Large Sky Area Multi-Object Fiber Spectroscopic Telescope (LAMOST) generate tons of data for astronomer to analysis and study. And in the near future, astronomy projects including Five hundred meter Aperture Spherical radio Telescope (FAST), Large Synoptic Survey Telescope (LSST), Square Kilometer Array (SKA), Cherenkov Telescope Array (CTA), Dark Energy Spectroscopic Instrument (DESI), EUCLID telescope and James Webb Space Telescope (JWST) will provide even more data for astronomical research. When astronomer and computer expert working day and night mining all these data sets for astronomical discoveries, some scientists and educators trying to use these data design activities, projects, software and platforms for education and public outreach purposes.

Astronomical Education and Public Outreach (EPO) are important for astronomical community because they could influence the social recognition of astronomy research and projects. Good EPO also means there will be plenty of students interested in astronomy and become astronomer in future. (Cui & Li 2018) Common Astronomy EPO methods include regular class, expert lecture, astronomy book, science popular video, science museum, small science project and so on. They are all successful and important methods for Astronomy EPO, but as the development of computer science and internet technology, people start to create new ways with astronomical data. Some of them were initiated by scientists and for scientific research purpose, like "Galaxy Zoo" project (Fortson et al. 2012), SETI project. Some projects were initiated by astronomer and designed for public



**Figure 1.** Influential data-driven Astronomy education and public outreach projects.

outreach like Data2Dome. Some idea came from amateur astronomer or engineer, like Popular Supernova Project (PSP) and WorldWide Telescope (WWT). All of them are successful and meaningful projects in education and public outreach, even in scientific research (Fig. 1).

The main core of DAEPO projects is the astronomical data. They have to be real science data directly or indirectly from actual telescope observation. The data usually been specially processed by scientists before released to public for they can be better understand by a wide range of participants. The pattern of how people involve in these kind of project were also pre-designed for a better result. In Popular Supernova Project, all image was cut into a suitable size for browse online and the user only need to follow a very simple process to achieve final discovery. (Li et al 2016) Because of the real data and the participation of scientists, DAEPO projects usually has an advantage to guide public participants to real scientific discovery in astronomy area. At the same time, this kind of deep involvement of scientific data and scientists can also bring latest discovery to public efficiently. For example, WorldWide Telescope (WWT) is a cross-platform data visualization engine widely used by educators, students and amateur astronomer. Also this platform is ideal for astronomer to create video abstracts to demonstrate their research. (Rosenfield et al. 2018) In this way, video abstracts will easily been browsed by students who are interested in astronomy. Another promising example is Data2Dome project from ESO. They describe a vision that the system will integrates data into full-dome planetarium systems seamlessly. Planetarium no longer just playing movie but becoming an astronomical information terminal. Images, video, audio, news, events and other astronomical data can be showed to the public after published in a few hours.

In April 2017, IAU Inter-Commission B2-C1-C2 working group Data-driven Astronomy Education and Public Outreach (DAEPO) was launched officially. Act as a forum, this IAU working group connect data related astronomy EPO activities and keep an open mind to multiple expressions. It can provide abundant tools and practices for the new initiated IAU Office of Astronomy for Education (OAE) and help using astronomy for teaching and education at school level.

## References

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