

ASTRONOMY FOR SPECIAL EDUCATION NEEDS

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ABSTRACT

Astronomy education is a unique field of study with an interdisciplinary exploration of natural science and science communication process, which may be able to provide Diversity Learning through Multiple Intelligence. It could potentially support and provide learning incentives for children with special education needs (SEN), including attention deficit (ADHD), autism spectrum disorder (ASD), and developmental dyslexia. Recently, the IAU National Astronomy Education Coordinator Team (Hong Kong), are conducting action research and observation, exploring different angles of Astronomy by organizing different types of activities, methodologies, and innovative approaches. We wish to explore new methods for motivating children to learn science and design-thinking mindsets through hands-on experience and build up their interest through self-directed learning and cooperative learning with peer interaction

RESUMEN

La educación en astronomía es un campo de estudio único con una exploración interdisciplinaria de las ciencias naturales y el proceso de comunicación científica, que puede proporcionar un aprendizaje de diversidad a través de la inteligencia múltiple. Potencialmente, podría apoyar y proporcionar incentivos de aprendizaje para niños con necesidades educativas especiales (SEN), incluido el déficit de atención (TDAH), el trastorno del espectro autista (TEA) y la dislexia del desarrollo. Recientemente, el Equipo Coordinador Nacional de Educación en Astronomía de la IAU (Hong Kong), estamos realizando investigaciones y observaciones, explorando diversos ángulos de la Astronomía mediante la organización de diferentes tipos de actividades, metodologías y enfoques innovadores. Deseamos explorar nuevos métodos para motivar a los niños a aprender ciencias e incentivar una mentalidad de pensamiento de diseño a través de la experiencia práctica y desarrollar su interés mediante aprendizaje autodirigido y el aprendizaje cooperativo con la interacción entre pares.

Key Words: astronomy education — inclusive astronomy — STEAM

1. OVERVIEW WITH CONCEPT DIAGRAM

Three main elements should be considered for astronomy education in special education, including STEAM (Science, Technology, Engineering, Art and Mathematics), SEN (Special Education Needs), and astronomy education (Fig. 1).

To begin with STEAM, it is believed that science communicators or educators will be familiarized with this term. We usually apply this to experiential learning and practical exploration, but we should not overlook the needs of our targeted audiences. By learner-centered approaches and pedagogy, we should customize our teaching methods based on the learning progress and make adjustments frequently to motivate SEN students learning incentives and attitudes.

Concerning that there are different special education needs, attention deficit (ADHD), autism spectrum disorder (ASD) and developmental dyslexia are the cases which might usually occur in classrooms

and tutorial centers. It is crucial to think of interdisciplinary strategies and diversity learning to provide a “more suitable” learning environment for SEN students (which should be based on observation and design thinking (Brown 2008), rather than providing “the best” educational materials.

“STEAM+A@Astronomy” is a social innovation project related to astronomy innovation, proposed by Exodus CL Sit (international transmedia astronomer from Hong Kong) who is the Chair of Hong Kong, IAU National Astronomy Education Coordinator Team. He suggested that we should simply separate astronomy education into three directions, including dark-sky protection (environmental aspect), stargazing and astrophotography (experiential aspect), and astrophysics and cosmology (theoretical aspect), as shown in Fig. 1. It is an example of reframing our understanding of “astronomy education”, which is no longer limited by observational astronomy, mathematical calculator, and computational analysis, but we can think of effective science communication.

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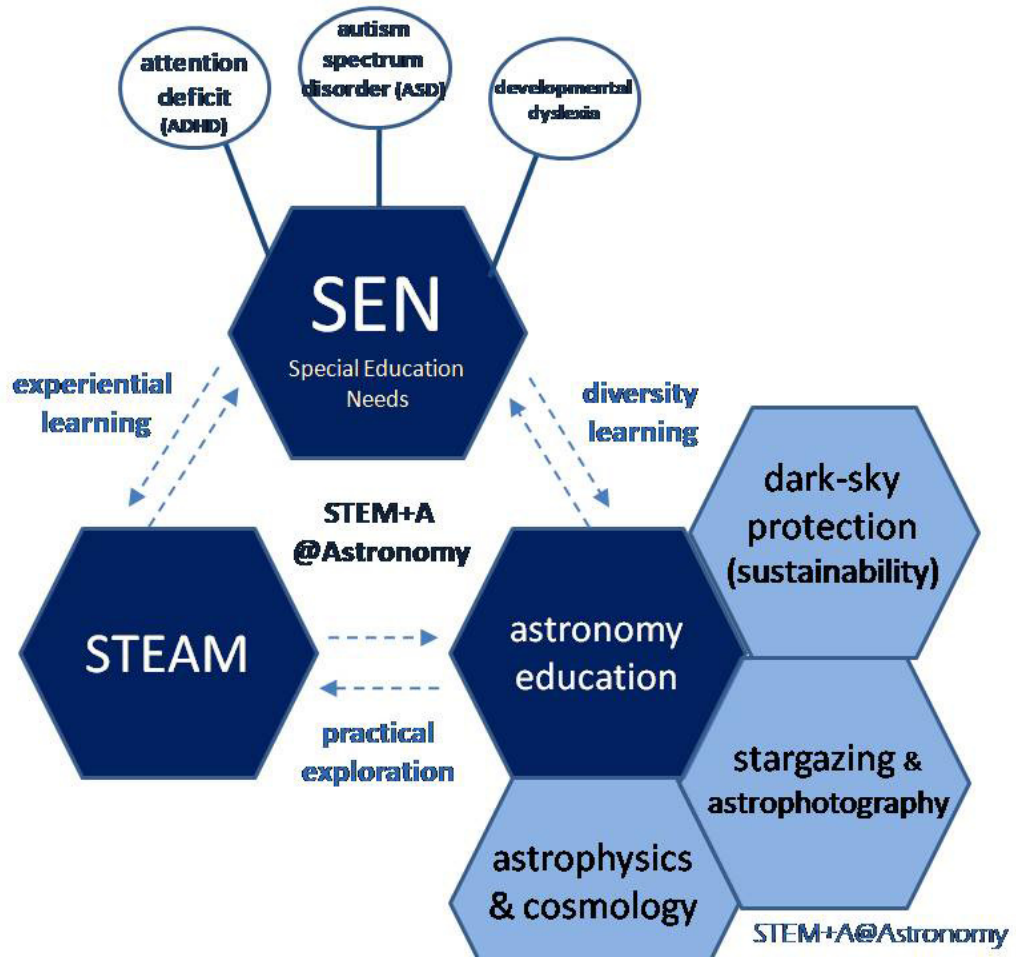


Fig. 1. Concept map on STEAM, SEN and Astronomy Education.

For example, to find an propose ways to draw people’s attention by showing the importance and connection of astronomy to our daily life, to attract SEN children to learn astronomy with fun, or even become their future career aspirations, to make these astronomical theories simple, to be equally spread out to different people without barriers or difficulties through popular science.

2. APPLICATIONS AND IMPLEMENTATIONS

It is important to understand the factors of escape behaviors (antecedents and consequences with special education needs) to motivate their incentives of learning science. Astronomy, as an interdisciplinary subject, could be a starting point to apply different teaching methods and educational materials for children. The idea is summarized into “4Cs” for better memory, such as Conversation, Consistency, Communication, and Choice without options. We can try to understand what SEN children are interested in. Try to be empathetic when you are putting yourself

into other shoes. Always we should keep listening to their expressions of internal thoughts and provide suitable astronomy experience, based on their needs and learning styles.

We could also apply diversity learning to Astronomy Education with learner-centered approaches. The process is shown in Fig. 2.

3. CONCLUSION

The summary of the research of astronomy education for special education needs, with reference from past experience on science communication and implementation of design thinking methods (Brown 2009) on astronomy, will be concluded in the followings:

- For the “Empathize” stage of Design Thinking, promoting astronomy should be targeted-oriented. By considering an interdisciplinary science, it can be integrated with other dis-

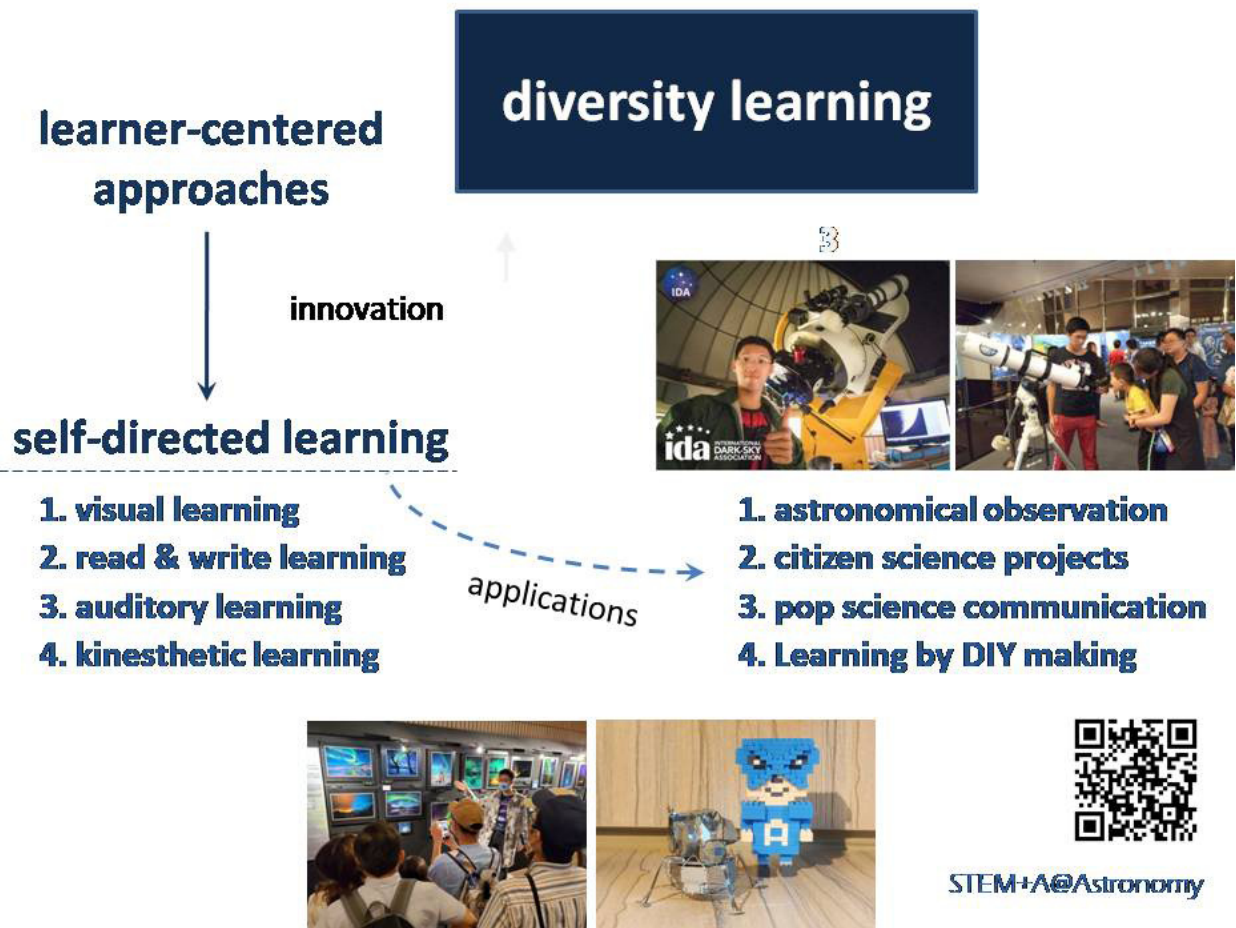


Fig. 2. Main aspects explaining the process of diversity learning.

ciplines, including art, environment, and philosophy.

- Followed by the “Define” stage, Effective science communication in special education should always take the learner’s needs and interests into account. It is learner-centered (what they learn), which is better than astronomer-centered (what we teach).
- In the “Ideate” stage, Diversity learning can fulfill different learning styles and needs, and the experiential learning activities in teams can be any format related to astronomy.

- In the “Prototype” and “Test” stage, it is great to consider teaching astronomy as a process of educational design. It is encouraging to make adjustments on every lesson or outreach experience, based on learner’s engagement, feedback, and reflection (whether it is related to observational astronomy or theoretical studies)

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