A Multi-Sensory Approach to Search for Young Stellar Objects in CG4

Abstract: Individuals with disabilities—specifically individuals who are deaf or hard of hearing (DHH) or blind or visually impaired (BVI)—are traditionally underrepresented in the STEM fields. Our goals are threefold: to engage DHH and BVI students with equal success as their sighted and hearing peers, to share our techniques in order to make astronomy more accessible to DHH and BVI youth, and to generate a life-long interest which will lead our students to STEM careers. Educators from Yerkes Observatory, the Wisconsin School for the Deaf (WSD), the Wisconsin Center for the Blind and Visually Impaired (WCBVI), Breck School, and Oak Park and River Forest High School (OPRFHS), are engaged in active research with Spitzer Space Telescope scientists within the NASA/IPAC Teacher Archive Research Project (NITARP). During the spring, summer, and fall of 2010, the group coauthored a poster on finding Young Stellar Objects (YSOs) in the CG4 Nebula in Puppis using various techniques for engaging DHH and BVI students. We gratefully acknowledge funding from NITARP, SOFIA, NSF, Lions Clubs, and AASJW.

How do we accommodate blind and visually impaired (BVI) and deaf and hard of hearing (DHH) students learning astronomy?

Recognize expertise and promote leadership

WSD team specialized in visualization and three color images with DS9, created a “how to” manual, created ASL videos to explain NASA movie simulations of star and solar system formation.

WCBVI team researched Spitzer Telescope and created an Excel tool with control by keystrokes and macros for importing data, applying cuts, and creating plots, created tactile and embossed images.

Breck team analyzed mathematical data and checked photometry with Aperture Photometry Tool (APT); took the lead on the science poster “540.08 Searching for Young Stellar Objects in CG4”

Include blind and visually impaired

Create tactile or embossed graphics

Audio files, text files of presentations, and alternative text for graphics and pictures

Overview and detailed descriptions of graphics, with emphasis on spatial relationships

Make software programs accessible with audio; control with keystrokes rather than relying on mouse clicks.

Allow and provide accommodating technology, such as screen readers, electronic or Braille notetakers, oculars.

Ask students what they need and use now.

Create Tactile Graphics

Braille and Big Dots on Plot

Conclude:

Science is possible for all students and everyone deserves the opportunity to reach their full potential.

Applying principles of universal design improves education for all students regardless of ability.

We must improve our language, technology, and leadership to give all students opportunities in science and astronomy.

Involving new voices enriches the field for everyone in the future.

Accommodate for BVI and DHH (and every student)

Follow students’ lead to adapt for learning styles and abilities

Encourage independence

Full participation in labs, multi-sensory setups

Hands-on STEM experiences

Access to mentors and role models

Listen and discuss, have high expectations

Encourage students to express their understanding of concepts and to describe observations, directions, routines, and processes from their unique perspective.

Create ASL video to narrate simulations.

Include deaf and hard of hearing

ASL for Content

Provide competent American Sign Language (ASL) models for content knowledge

Create body of resources for future students

Students create multimedia projects

ASL Interpreters

Do not shy away from “dense” terminology.

Fingerspell terminologies that do not have formal ASL signs

Video

Create and/or use available captioned videos

Communicate and collaborate (Skype, video relay interpreters)

We have found that beneficial accommodations for our Deaf students include: using sign language to communicate the information, providing a visual demonstration, showing images or short video clips, using a notetaker and allowing for ample time for hands-on work.

Making information and instruction more visual for Deaf students is vital to their education and understanding of new material. - Jan VanDerMolen

Move the color bar side to side to change the color from visible to invisible. Repeat with the other 2 colors.

How to Make a Color Image in DS9 by students Lyssa and Anna.

Open up SAOImage DS9. Click on “Frame” then click “New RGB” (if needed, put the box out of the way so that you can always go right back to it when you are on your next picture.) Next, click on any color that you want from the RGB box. Click inside the DS9 box, then click “File,” then “Open.” Find “My mosaic”, then click to open any photo. Double click on the photo you choose and it will open on DS9. Once it has opened, click on “Scale”, then click on “Histogram.” Now you need to go back to the RGB box and choose another color. Repeat steps 4-7 for the last 2 colors. (Remember, the images can’t be the same you used previously.) All colors are Red, Green, and Blue should be covering each other. Now you have your color photo! If you want to adjust the colors, you can! All you have to do (on a Mac) is to click on a color from the RGB box, then go down to where there is a row of the colors on the bottom of the color picture. Then, click and hold the “Apple” button and the mouse button at the same time. Move the color bar side to side to change the color from visible to invisible. Repeat with the other 2 colors.

As a teacher I have found that adapting my lessons for BVI has helped me understand the needs of all my students. - Lee Gamble

Let’s cool, looking at the pictures, finding the stars. It’s like a game.

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4

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