**Research Based Astronomy in the Secondary Classroom**

**Lessons Developed For Investigating YSO’s Using APT, Excel, and MOPEX**

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**Learning By Doing**

As students practiced with software like APT, they shared their ideas via the Wiki, e-mail, and Skype web conferencing. Students developed a list of possible YSO candidates, converted counts to magnitudes in 5 channels and produced Spectral Energy Distributions (SED).

**ABSTRACT**

As students practiced with software like APT, they shared their ideas via the Wiki, e-mail, and Skype web conferencing. Students developed a list of possible YSO candidates, converted counts to magnitudes in 5 channels and produced Spectral Energy Distributions (SED). This research was made possible through the Spitzer Space Telescope Research Program for Teachers and Students and was funded by the Spitzer Science Center (SSC) and the National Optical Astronomy Observatory (NOAO). Please see our companion education poster by McDonald et. al. titled “Spitzer - Hot and Colorful Student Teacher Outreach – Programs and Presentations”.

**Technology Transfer**

Communication = Education Communication through Various Modalities

**Wiki**

Teachers met regularly to discuss the YSO selection techniques prior to data acquisition. Teachers developed criteria for Lynd Cloud Selection, Magnitude and Flux Density, and handled housekeeping.

**Face to Face**

First meeting at January 2008 AAS (Austin Texas) Review of 12 laboratory experiments in Infrared Technology. Meet with Dr. Rebull – Discussed possible study developed criteria for Lynd Cloud Selection. Assigned Tasks.

**Spitzer Teachers and Students**

4-day conference Spitzer Science Center, June 2008.

- YSO selection techniques
- Magnitude and Flux Density
- Use of available software: Spot, Leopard, MOPEX, APT, and Excel Spreadsheet

**Conclusion**

The implementation used an astronomy and the necessity of space-based telescopes. The physical properties of light, such as wavelength and flux and about emission and absorption. How stars evolve from birth to eventual death. Students And Teachers Became Hands On Learners: compared the images obtained by IRC and MIPS, produced false-color images that enhance the features of young stellar objects and the interstellar cloud. Extracted data tables of sources and fluxes at each wavelength. Using authentic data students were able to generate color plots.

**Summary**

Students And Teachers Learned:

- The instrumentation used an astronomy and the necessity of space-based telescopes.
- The physical properties of light, such as wavelength and flux and about emission and absorption.
- How stars evolve from birth to eventual death.
- Students And Teachers Became Hands On Learners: compared the images obtained by IRC and MIPS, produced false-color images that enhance the features of young stellar objects and the interstellar cloud. Extracted data tables of sources and fluxes at each wavelength. Using authentic data students were able to generate color plots.

**Spitzer Science And Technology Standards**

The national science standards addressed in this project are the structure and function of matter, interactions of energy and matter, the origin and evolution of the Universe, and the abilities of technological design.

**In the Future**

Images of this group produced will be useful in future public presentations. Dramatic illustrations of YSOs and star forming regions will be shared with other teachers via workshops and presentations. Students will be able to access the data sets already available in the Spitzer archive to compare the data with other clusters. Lessons that allow students to research and develop their own scientific presentations.

These workshops and lessons promote inquiry-based learning experience and peaked interest in science, technology, and space research.