Astronomy Research Seminar

Impact on Student Education and Careers

Rachel Freed
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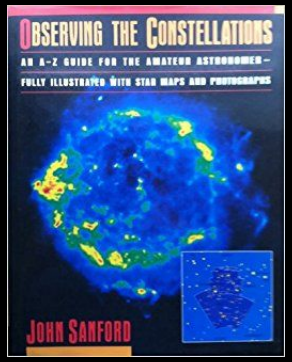
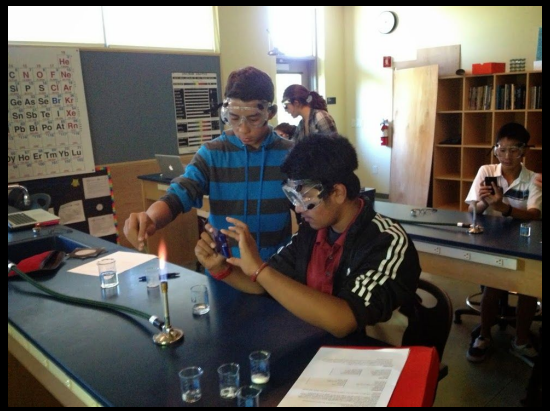
A 9-Year-Old's Dream



How did astronomy capture your imagination?

When did you become passionate about astronomy?

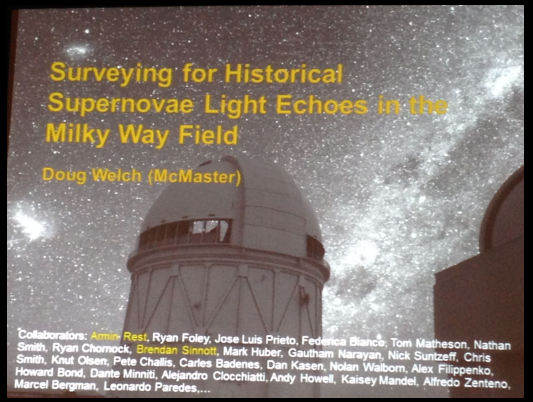
How do you make education meaningful and relevant?

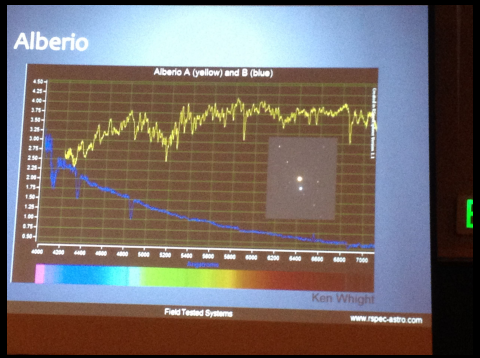


History of the Research Seminar

2008

Society for Astronomical Sciences





Institute for Student Astronomical Research (InStAR)

CCD Astrometry of Select Stars in the Washington Double Star Catalog

Ashwini Iyer[1], Izzy Gross[1], Rachel Freed[1], Chris Spenner[1], Jolyon Johnson[2], Russell Genet[3, 4, 5]

1. The Harker School, San Jose, California
2. University of Washington, Seattle
3. Cuesta College, San Luis Obispo, California
4. California Polytechnic State University, San Luis Obispo
5. Concordia University, Irvine, California

Double Star ID	Year of Last Observation	# Obs.	Separation (arc seconds)		Position Angle (degrees)	
			Last	Present	Last	Present
LDS 1679	2003	3	142.7	142.67	107	106.4
LDS 1715	2000	2	80.3	81.11	320	321.5
LDS 1778	2004	3	26.7	26.34	302	300.6
STF 1455 A, BC	2012	18	33.8	34.23	251	249.4

Institute for Student Astronomical Research (InStAR)

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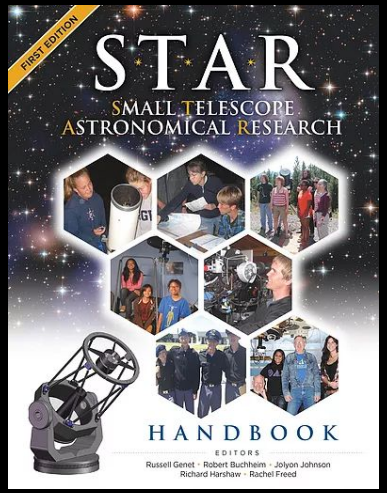
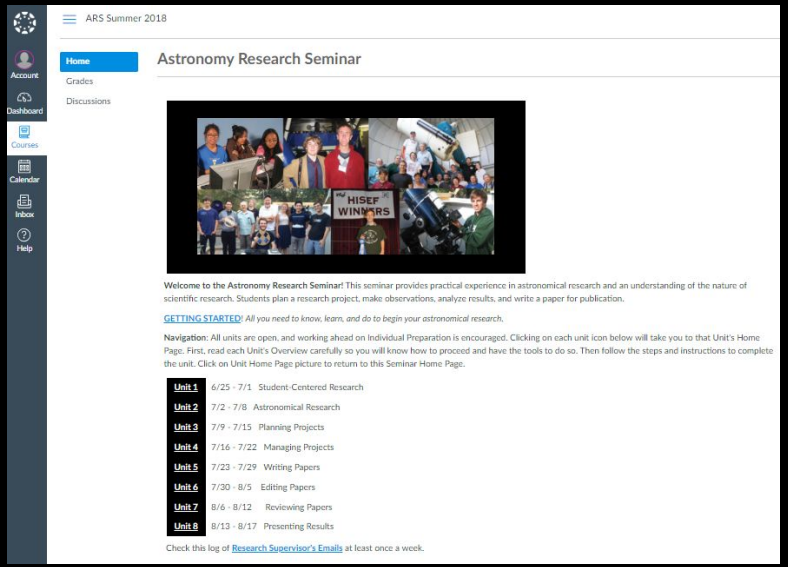
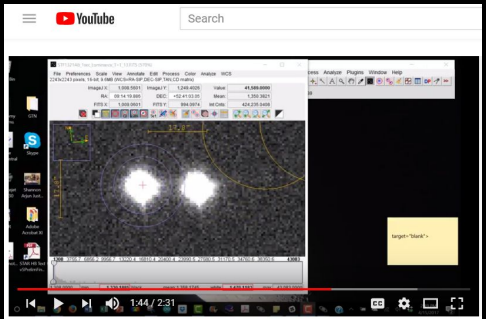
Welcome!

InStAR Courses and Resources

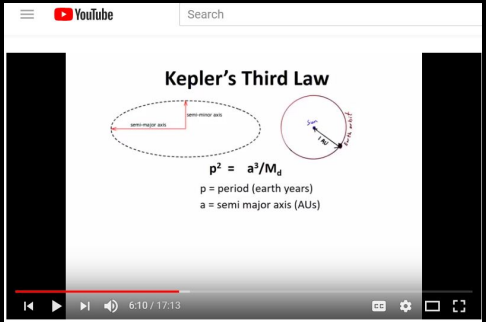
In4star.org







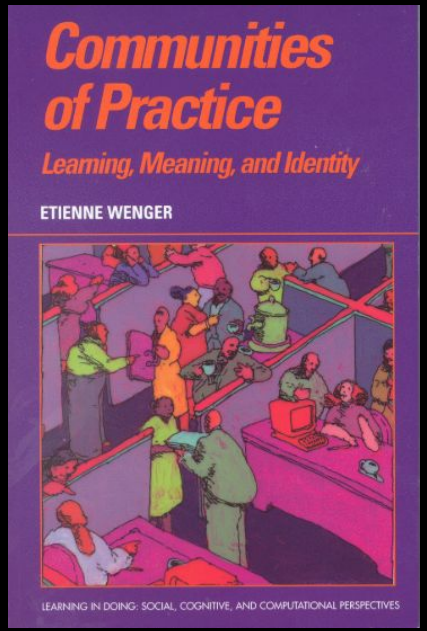
Astrometry.net and AstroImageJ Astrometry



Visual Double Star Astrometry

NSF Grant

Student Research within Communities-of-Practice



Learning transforms our identities

Information for its own sake is meaningless

NSF Grant # 1610350

C-of-P

Learning transforms our identities: it transforms our ability to participate in the world by changing all at once who we are, our practices, and our communities.

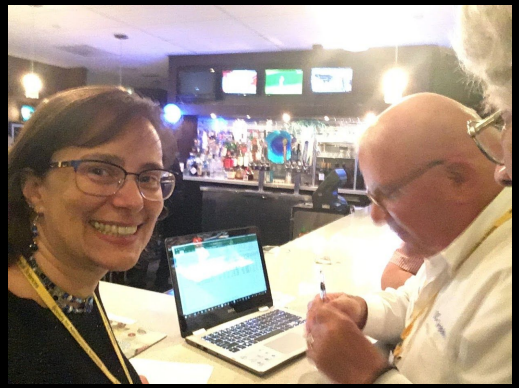
C-of-P

Information for its own sake is meaningless; it must capture our identities and expand them. … it is more important for the informational content of an educational experience to be identity-transforming than to be “complete” in some abstract way. This is especially true in a world where it is clearly impossible to know all there is to know, but where identity involves choosing what to know and becoming a person for whom such knowledge is meaningful.

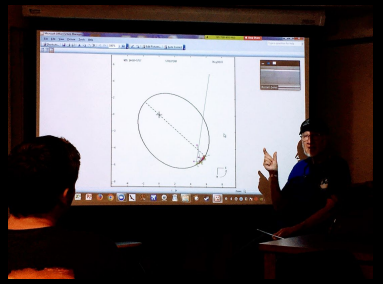
Great Basin Observatory

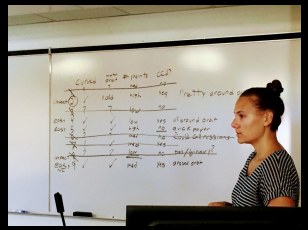
- Concordia University
- Southern Utah University
- University of Nevada, Reno
- Western Nevada College

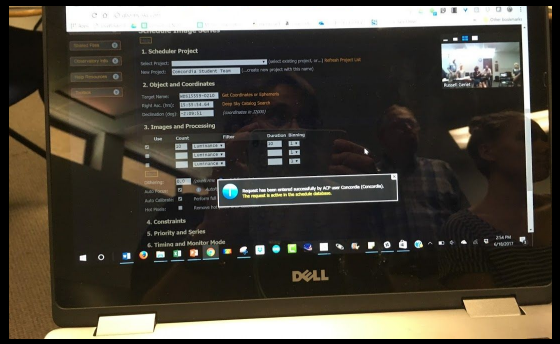
ACP!



The next day...







Accepted for publication by the *Journal of Double Star Observations, August 7, 2017*

An Astrometric Observation of Binary Star System WDS 15559-0210 at the Great Basin Observatory

Double star research

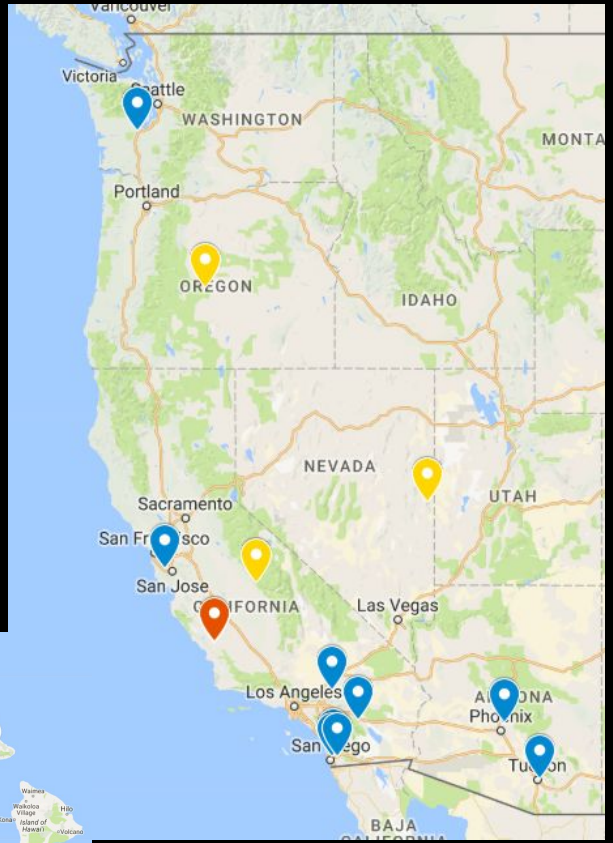
Vol. 14 No. 2 April 1, 2018 Journal of Double Star Observations Page 204

Refuting S 825AB System Classification through Astrometry and Gaia Satellite Data

Noah Lyman[1], Lila Musegades[2, 3], Edward Davis[4, 5], Micah Briney[5], Aaron Francis[5], Cole Niebuhr[3], David Rowe[6], Richard Harshaw[7], and Russell Genet[5, 8]

1. University of California Santa Cruz, Santa Cruz, CA
2. Concordia University Irvine, Irvine, CA
3. Global Science Directive, Las Vegas, NV
4. Humboldt State University, Arcata, CA
5. Cuesta College, San Luis Obispo, CA
6. PlaneWave Instruments, CA
7. Brilliant Sky Observatory, Cave Creek, AZ
8. California Polytechnic University, San Luis Obispo, CA

Seminar Growth



PASO ROBLES BEARCATS

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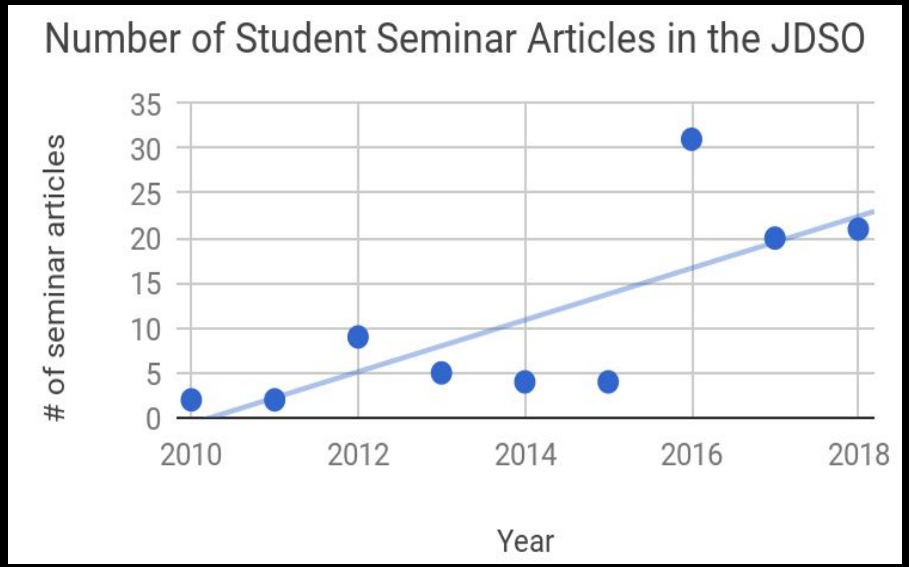
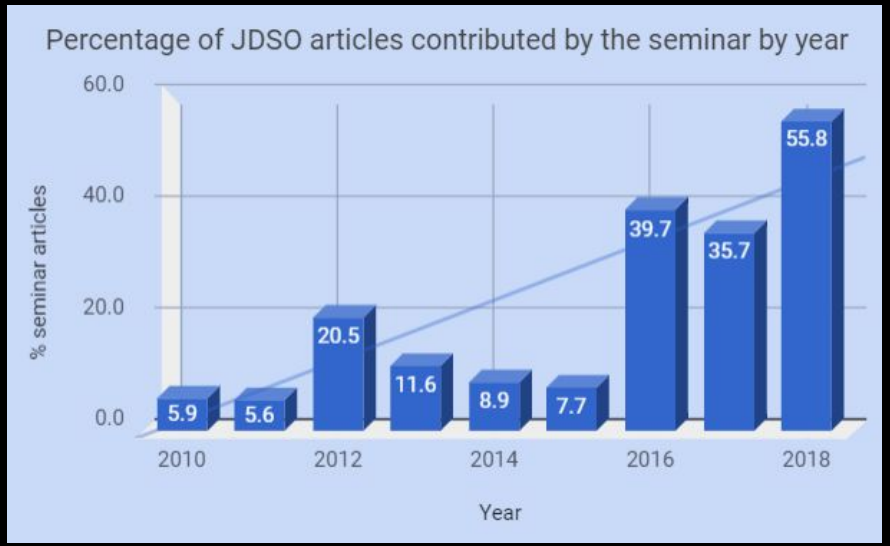
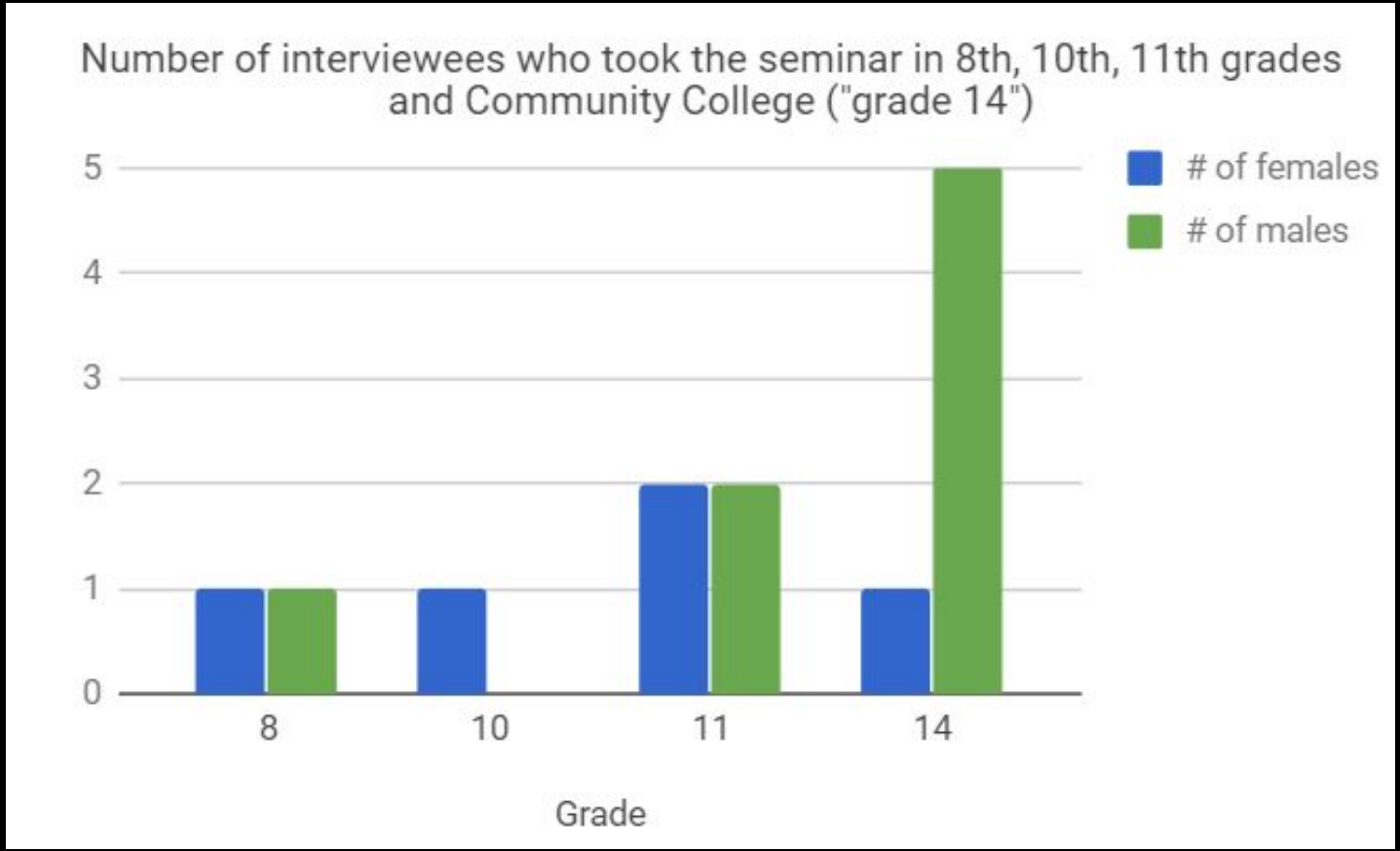
INSTITUTE FOR STUDENT ASTRONOMICAL RESEARCH

First Author Last	First	Year	Student Team Paper Title
Adam	Meryl	2015	First Speckle Interferometry Observation of Binary BU 1292
Adam	Meryl	2015	Speckle Interferometry Observation of Binary WDS 01528-0447
Ahiligwo	Jonelle	2012	Chico High School Students' Astrometric Observations of the Visual Double Star STF 1657
Alduenda	Chandra	2012	Separation and Position Angle Measurements of Double Star STFA 46 and Triple Star STF 1843
Allen	Cameron	2015	Double Star Research with Speckle Interferometry
Alvarez	Pablo	2009	A Comparison of the Astrometric Precision and Accuracy of Double Star Observations with Two Telescopes
AlZaben	Faisal	2016	CCD Astrometry with Robotic Telescopes
AlZaben	Faisal	2016	Measurements of Multi-star Systems LEO 5 and MKT 13
Anderson	Serenity	2016	Vanguard Preparatory School Observations of the Double Star STF 1692
Arcilla	Marisa	2017	Data and Analysis of the Double Stars STFA 10AB and STFA 1744AB
Armstrong	J.D.	2016	Accuracy and Precision of Multicolor Observations of Four Double Stars
Bateman	Grace	2017	Student Measurements of Double Star STF 747AB
Baxter	Alexandra	2011	Comparison of Two Methods of Determining the Position Angle of the Visual Double Star 61 Cygni
Bensel	Holly	2013	Comparison of Visual Data Collection Techniques on Mizar: The Barlow Lens
Bensel	Holly	2012	Comparison of Data on Iota Boötes Using Different Telescope Mounts in 2009 and 2010 by the St. Mary's School Astronomy Club
Bidler	Jeff	2016	Observations of Omicron 1 Cygni (STFA 50AD)
Brashear	Nicholas	2012	Observations, Analysis, and Orbital Calculation of the Visual Double Star STTA 123 AB
Brewer	Mark	2016	CCD Measurements of the Double Star STF 1744AB
Brewer	Mark	2016	Student Measurements of the Double Star Eta Cassiopeiae
Brewer	Mark	2016	Student Measurements of the Double Star STFA 35
Brewer	Mark	2013	Student Measurements of the Double Star STFA 28AB Compared with 18th - 21st Century Observations
Brewer	Mark	2012	Measurements of the Double Star STFA 10AB
Brewer	Mark	2012	Student Measurements of 3 Binary Star Systems
Caballero	Rafael	2013	Six Proper Motion Pairs Measured with the 2-meter Faulkes Telescope North

Student Publications in the JDSO






Number of interviewees who took the seminar in 8th, 10th, 11th grades and Community College ("grade 14")
5
4
3
2
1
0
8
10
11
14
Grade
# of females
# of males

Evaluation – perceived benefits

What were one or two of the best things you got out of the seminar?

“One of the best things was that collaborative environment. I’ve worked in teams before but it was very different. There was a lot of people from different backgrounds, different grade levels, different experiences, and being able to work 1 on 1 with a professor was a really interesting experience that I had never had before. Also, being able to say I have a published research paper has come in handy so many times. I am currently looking for internships and I’ve been bringing that up, talking about it during interviews.” (2014, 10th grade; F)

Evaluation – the publication

Your published paper...did you use that in applications?

“It’s been on my resume since it happened. It’s still on my resume. It’s actually a pretty big talking point. When it comes up people say ‘tell me more. That has nothing to do with [what you are doing]. Why did you do this?’. I explain that it was a really good opportunity to learn about how research works at a young age, and to get good exposure to the whole process. It was a very cool experience, and I still have it on my resume.”
(2008; 11th grade; F)

Evaluation – scientific writing

Did you learn during that seminar how to write scientifically?

“Yes, I think so. Prior to the paper, I have taken scientific lab courses, where they tell you how to write your procedure, your results, things like that. But when I compare some of my labs for AP Physics with the types of papers you may see in the JDSO, there is definitely a very big difference and without the research seminar it may have been a bit longer before I learned how to write in that way.”

(2016; 8th grade)

Evaluation – identity as a scientist

Do you consider yourself a scientist?

“I do. Yes. Probably a year or two after we started going with these workshops [that I ran].
Mostly because of writing the scientific publications and doing the analysis on the data that we gathered. That's when I realized that’s pretty much what a scientist does. I also have participated where I just gathered data and feed it on to the scientist but with the double star research you're actually being the scientist.” -
Student 2 (2011; college junior; M)

“Yes. I think anyone who discovers something or works to do research is a scientist because science is all about discovery and learning about these new things. It’s really hands-on.” – Student 8 (2016; 8th grade; F)

Evaluation – identity as a scientist

Do you consider yourself a scientist?

“Absolutely...I think that that experience was really just good exposure for me being really comfortable with finding and participating in research in undergrad which is really important if you want to go to medical school that you do research projects and I in undergrad never got an experience like that where I was able to be one of the main...I was always tacked on to somebody else’s project to do the data entry. You don't really get an opportunity in a big school like that to have your own project...It gave me the confidence... I can do that. If I did it in high school of course I could do that now. I do a ton of research now. I'm actually starting a research committee with one of my classmates to connect students with research projects and we just got our IRB back last week because we are doing a study on the community to see how successful the committee will be in getting more opportunities for students.” - Student 1 (2008; 11th grade: F)

Evaluation – identity as a scientist

Do you consider yourself a scientist?

"Do you consider yourself a scientist?"
"I would consider myself to be growing into a scientist but I wouldn't quite call myself a scientist just yet." - Student 12 (2017; 11th grade; M)
"What will make the difference between you growing into a scientist and being a scientist?"
"Probably the one thing is sort of experience, actually publishing papers, doing research, I haven't been doing that kind of thing for very long so it wouldn't quite feel right calling myself a scientist yet. That's going to change in college I'm pretty sure."
"You just need more experience?"
"I've only been doing this kind of thing for a year, so yeah."

Evaluation – identity as a scientist

Do you consider yourself a scientist?

"Do you consider yourself a scientist?"
(pause) "This has been a point of contention in my mind for a long time now. When I started doing the double stars seminar what do you have to do to consider yourself a scientist? What is the line? The point I came out with in my head was that once I was contributing data to the community that is when I considered myself a scientist...so I would say yes." - Student 6 (2016; 3rd year community college: M)

Evaluation

How did the Astronomy Research Seminar most benefit you?

“I learned how to write a research paper, and how to work as a team in a real world way (unlike the "equal participation" stuff I have learned to dislike). I wasn't really in it for the astronomy, but it turns out that was pretty fun too.”

Evaluation

How did the Astronomy Research Seminar most benefit you?

	% of responses included this
Paper writing	43
Scientific Research	34
Teamwork	26
Astronomy	9

ROBOTIC TELESCOPES, STUDENT RESEARCH AND EDUCATION CONFERENCE 2018

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https://rtsre.net/

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InStAR Workshop Sunday, June 17, 2018

PlaneWave™ INSTRUMENTS

Register here:

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