

STEM Career Investigation Program (SCIP)

Final Report, Spring 2015

EPSCoR Nexus, Workforce Development Component

Contents



Jacque Ewing-Taylor, Ph.D.

Nexus Workforce Development Component Lead

Brittney Timmons

Graduate Research Assistant, SCIP Project Coordinator

Raggio Research Center for STEM Education

College of Education

University of Nevada, Reno

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The STEM Career Investigation Program (SCIP) completed its third semester of operation in spring 2015. SCIP was funded through the EPSCoR Nexus grant that will run through 2018. The purpose of this document is to report on the spring 2015 operation of SCIP.

OVERVIEW OF THE STEM CAREER INVESTIGATION PROGRAM (SCIP)

The STEM Career Investigation Program (SCIP) is conducted for high school sophomores, juniors, and seniors in Nevada. The goal of SCIP is to provide students with opportunities to observe research and career presentations by STEM professionals in a wide array of specialties in order to understand how the STEM disciplines are integrated. In



addition, the presentations outline possibilities for student's future career paths. Speakers from the College of Engineering, College of Science, College of Mathematics, and the Medical School at University of Nevada- Reno (UNR) and a speaker from the Washoe County Sheriff's Forensic Division were invited to present their current research projects to the students and discuss future job possibilities and academic preparation for someone with their degree and area of specialization.

Presenters for the spring 2015 SCIP sessions were recruited through email by the Principal Investigator and Graduate Research Assistant. Presenters were recommended by various Nexus and UNR staff. Six possible presenters were contacted, with an additional two people on a waiting list. All original six possible presenters agreed to be a part of the SCIP program. Presenters were given an outline of expected talking points for their presentation. Among these expectations were educational background, current research, and current job responsibilities. Additionally, presenters were asked to be willing to answer any and all questions asked by the participants in the program.

SCIP SPRING 2015 SESSIONS

Participant Recruitment

Recruitment for the spring 2015 SCIP sessions began in October 2014. Recruitment took place through emailing Washoe County School District (WCSD) Department Leaders, counselors, and educators who were asked to pass the information along to students. Moreover, flyers were printed and mailed to each high school in WCSD to be displayed where students would have access to the information. Additionally, the WCSD Science

Coordinator, Kelly Cannon, distributed flyers and information to science teachers in all WCSD high schools.

Participants

Fifty-six WCSD high school students applied to the SCIP Program and forty-four were accepted on a first-come, first-served basis. Forty-four of those accepted students attended the program, while twelve students declined acceptance or did not attend.

Twenty-two of the forty-four high school students that attended were female. Twenty-two of the students were male (Table 1).

Table 1 SCIP Participant Gender

Gender	Number	Percentage
Male	22	50%
Female	22	50%
Total:	44	100%

Sixteen of the students were 10th graders, twenty were 11th graders, and eight were 12th graders (Table 2).

Table 2 SCIP Participant Grade Levels

Grade Level	Number	Percentage
10th Graders	16	36.00%
11th Graders	20	45.50%
12th Graders	8	18.50%
Total:	44	100.00%

Of the sixteen 10th graders, seven students were female and nine were male. Of the twenty 11th graders, ten students were female and ten were male. Of the eight 12th graders, five students were female and three were male. Table 3 shows this distribution and the percentages in each category.

Table 3 SCIP Participant Grade Level and Gender

Grade Level and Gender	Number	Percentage
10th Grade Females	7	16.00%
10th Grade Males	9	20.00%
11th Grade Females	10	22.50%
11th Grade Males	10	22.50%
12th Grade Females	5	12.00%

12th Grade Males	3	7.00%
Total:	44	100.00%

Participating students were from eight different WCSD high schools, with the most participants coming from Spanish Springs High School and Truckee Meadows Community College (TMCC) High School. TMCC High School has the ability to email all of their students with educational information, therefore the reason for the majority of participants coming from this schools could be that the SCIP pamphlet was made available to every student associated with TMCC High School. The distribution among the high schools are indicated in Table 4.

Table 4 SCIP Participating High Schools

School	Number of Students	Percentage of Students
AACT High School	2	4.50%
Hug High School	1	2.50%
McQueen High School	2	5.00%
Reno High School	5	11.00%
Spanish Springs High School	14	31.00%
North Valleys High School	1	2.50%
The Davidson Academy	6	13.50%
TMCC High School	13	30.00%
Total:	44	100.00%

Table 5 shows the distribution of participants by ethnicity and race, as well as the percentage of the whole group. There was over 20% representation of underrepresented minorities in this SCIP program.

Table 5 SCIP Participant Ethnicity

Ethnicity	Students that answered "Yes"	Percentage of Students
Hispanic or Latino	8	18.18%
	Number of Students	Percentage of Students
American Indian or Alaska Native	0	0.00%
Asian	10	23.00%
Black or African American	0	0.00%
Native Hawaiian or Other Pacific Islander	3	7.00%
White	31	70.00%
Total:	44	100%

Finally, nine of the forty-four participants, or 20%, were return participants from the spring 2014 SCIP Program.

Sessions

At each session, students came to the Raggio Research Center for STEM Education (RRC) in the College of Education at the University of Nevada, Reno. Each session was on a Wednesday evening from 5:30 – 7:30 p.m. The sessions that were conducted in spring 2015 ran for six consecutive weeks from February 4– March 11, 2015. Students were provided with food (pizza or sub sandwiches) and beverages at the beginning of the sessions. At the first session, students took the STEM Attitudes Survey (Tuan, Chin, & Shieh, 2005). At the end of each individual session, students completed a STEM Session Survey about their experience at that particular session. Finally, at the completion of the final session, students took the STEM Attitudes Survey again and the Evaluator's survey.

Session 1- February 4, 2015

The first session was held on Wednesday, February 4, 2015. The students arrived at 5:30 p.m. and took the STEM Attitudes Survey. Then, students grabbed their dinner and sat to watch the first presenter. The presenter at the first session was Dr. Ravi Subramanian from the Chemical Engineering department at UNR. Dr. Subramanian discussed his work on solar energy, he talked about nanostructured materials for solar energy utilization, and discussed his career with the students. Additionally, Dr. Subramanian brought examples of some working devices to explain the working of energy through solar power.

Session 2- February 11, 2015

The second SCIP session was held on Wednesday, February 11, 2015. The students arrived at 5:30 p.m., grabbed their dinner, and sat down to listen to the second SCIP presenter. The presenters for the second session were Dr. Melissa Piasecki and Dr. Jennifer Hagen from the School of Medicine at UNR. Dr. Piasecki and Dr. Hagen discussed their educational background, their work, and their research in the field of medicine. They made students aware about the different professions in the medical school, they talked about diverse fields like psychology and pharmacy and encouraged students to understand that one should keep an open mind while making a career choice. Then, they performed an activity with the students learning about personality types, psychology, and how to work together in a group.

Session 3- February 18, 2015

The third SCIP session was held on Wednesday, February 18, 2015. The students arrived at 5:30 p.m., collected their food, and sat down to listen to the third SCIP presenter. The third SCIP presenter was Dr. Jennifer Hollander from the Biology Department at UNR. Dr. Hollander discussed her job as a professor of human anatomy and physiology and her research in seed dispersal and ephedra. Additionally, Dr. Hollander brought two of her anatomy lab students along to the presentation. With the help of these students, Dr. Hollander provided a hands-on experience with human organs for the students to explore in a separate lab session. Students were provided with gloves and detailed information from Dr. Hollander and her anatomy students.



Session 4- February 25, 2015

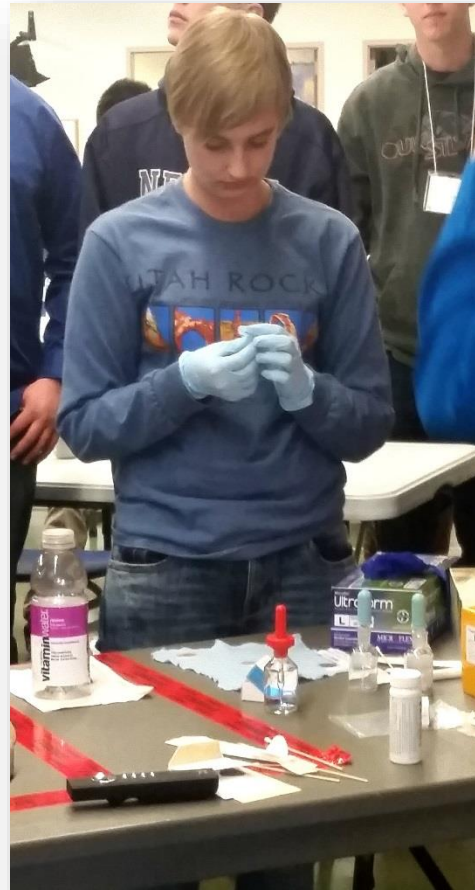
The fourth SCIP session was held on Wednesday, February 25, 2015. The students arrived at 5:30 p.m., grabbed the provided food, and sat down. The fourth SCIP presenter was Dr. Swatee Naik from the Mathematics and Statistics department at UNR. Dr. Naik discussed her background, her current job, and her research in Topology and Knot Theory. Dr. Naik conducted various activities including geometric figures and properties to explain her research. She also discussed the various career options in the mathematics and statistics field.

Session 5- March 4, 2015

The fifth SCIP session was held on Wednesday, March 4, 2015. The students arrived at 5:30 p.m., grabbed their food, and sat down to listen to the fifth SCIP presenter. The fifth presenter was Dr. Richard Kelley from the Computer Science and Engineering Department at UNR. Dr. Kelley is part of the EPSCoR Nexus project Cyberinfrastructure team. Dr. Kelley presented information on his work in robotics, his educational background, and the different career paths he could have taken with his various degrees. He talked about drones and their uses in detail. Additionally, Dr. Kelley brought examples of drones to share with the students. Moreover, SCIP Graduate Research Assistant, Brittney Timmons, provided a brief presentation on college life, based on participants' questions from the previous week.

Session 6- March 11, 2015

The sixth and final SCIP session for spring 2015 was held on Wednesday, March 11. The students arrived at 5: 30 p.m., grabbed their food, and sat down to listen to the final presenter. The final presenter was Dr. Brittany Baguley from the Forensic Science Division of the Washoe County Sheriff's Office. Dr. Baguley discussed her varied background, her research experience in Forensic Science, and her work as a Crime Scene Investigator. Dr. Baguley provided real crime scenarios and cases to the students and had them solve the cases through DNA and other forensic tests. She also conducted mini lab sessions in which students actually got hands on experience on how to detect blood stains and how different samples from the body can help in determining one's DNA. At the conclusion of the presentation, students took the STEM Attitudes Survey again. This survey was taken before the first session (pre-test) and at the conclusion of the final session (post-test). Additionally, students completed the Evaluator's survey at the conclusion of this session.



SURVEYS

SCIP STEM Session Survey

At the conclusion of each session, the participants took the SCIP STEM Session Survey, which asked students to rate the effectiveness of the session in regard to the content that was delivered, whether or not it related to their classes in high school, how well they perceived the integration of STEM in the presentation, if the content that was presented was new to them, and the worthiness of their time spent at the session. Moreover, the survey had two open-ended questions at the end that asked the participants why the presentation was beneficial to them and whether or not they had any suggestions for the program (Appendix A).

Since this survey rated six questions on a four point, Likert-type scale of Strongly Disagree (1) to Strongly Agree (4), the means were calculated for each question for each session to

determine the overall effectiveness of each speaker. The breakdown for each speaker is provided in

Table 6.

Table 6 Means for STEM Survey

Means for STEM Survey	
Presenter	Average (Out of 4)
Dr. Subramanian	3.12
Dr. Piasecki and Dr. Hagen	3.32
Dr. Hollander	3.47
Dr. Naik	3.44
Dr. Kelley	3.66
Dr. Baguley	3.61

Dr. Kelley was rated the most effective speaker by the participants according to the STEM Session Survey. Overall, all speakers scored a high average for their effectiveness in the SCIP program.

Student Attitudes toward STEM Survey

The Student Attitudes toward STEM Survey was provided to the students at the beginning of the first session and the conclusion of the final session. This survey was given as a pre/post assessment of the effectiveness of the program. The survey contained 26 questions. The questions spanned items from participants' future education plans to their confidence in STEM classes in high school. Other topics include whether or not the students feel supported in their community and their reasoning behind taking STEM courses. The full questionnaire is provided in Appendix B. Students responded to each question on a five point, Likert-style scale from Strongly Disagree (1) to Strongly Agree (5). The survey was modified from Tuan, Chin, and Shieh (2005).

Forty-two students completed both the pre-test and the post-test. Pre-test: ($M= 4.18$, $SD= 0.44$, $N=42$); Post-test: ($M= 4.28$, $SD= 0.45$, $N=42$); the difference was not significant at the .05 level, $t_{(29)} = -1.50$, $p = .07$ (significance level $p < .05$).

Evaluator Survey

At the conclusion of the final session, the participants were asked to complete an evaluation survey provided by the Nexus evaluation team, Smart Start Educational Consulting Services. A copy of the survey is provided in Appendix C. The evaluation survey contained questions regarding various aspects of the program, from speaker

effectiveness, to program organization, to overall satisfaction with the program. The evaluator's report concluded that the SCIP program was successful, receiving high ratings all around. A copy of that report is provided in Appendix D.

EVALUATION

Overall, the feedback from participants, presenters, and the evaluation team was extremely positive for the second year of the SCIP program. Additionally, the results from analyzing the pre and post STEM Attitudes Survey showed an increase in positive attitudes toward STEM degrees. While we are pleased with the second year of the SCIP program, a few changes will be made for the third year based on feedback from presenters, participants, and the evaluation team.

Recruitment

In year three, recruitment materials will be sent to the guidance counselors at every high school in WCSD, except the Davidson Academy at UNR. Since most of the students that sign-up for the program are self-selected, therefore they are usually already interested in STEM degrees, having more spots available to students who are unsure about pursuing a STEM degree is imperative. Moreover, Davidson Academy students are educationally advanced beyond the years of their high school peers from other schools, therefore they consistently found the information from the SCIP program rudimentary and boring for them, indicating that this program might better serve students outside of the academy. We believe that overall positive STEM attitudes would increase with this change because more students would begin the program without already having established an interest in STEM education.

Returning participants

A number of participants expressed an interest in returning for the third year of the SCIP program, especially those who had attended years one and two. New participants are important to influencing more high school students to pursue STEM degrees, yet we are honored that the program was beneficial to our first participants and that they found the second year equally, if not more, beneficial to them. Because of this, we will have limited spots open to return participants in the third year, accepting them on a first come, first served basis. Once those spots are filled, remaining spots will only be open to new participants.

Presentation guidelines

Participants, presenters, and the evaluation team suggested in-depth guidelines be provided to the presenters so that each presentation follows the same path. A more thorough letter will be created for the presenters in year three, outlining the expectations for the presentation. A detailed letter was created for year two, but hands-on activities were not as in-depth as the project coordinator or the students wanted, therefore even more explicit directions will be created.

Hands-on activities

The Project Coordinator suggested that each presenter provide a hands-on activity to further engage the participants during their presentation in year two. Most of the presenters provided a hands-on activity, but some were not as in-depth as others. Participants suggested that all presenters provide a relevant hands-on activity associated with their field and allow all students to participate in the activity. Since the hands-on activities were popular among the participants, they will be part of the presentation guidelines for year three, being further in-depth than previous years. Presenters will be expected to provide a half-hour hands-on activity following their interactive presentation. Moreover, with the large number of students, presenters will be required to have multiple areas for all students to participate in the hands-on activity.

Overall, the SCIP staff was satisfied with the operation of year two and will continue to develop the program during year three to make it more effective for participants and presenters.

Appendices

Appendix A

SCIP STEM Session Survey

SCIP STEM Session Survey				
Please respond to the following items regarding tonight's seminar program by circling the response that best fits your level of agreement.				
*Please rate how strongly you agree or disagree with each statement.				
	Strongly Disagree	Disagree	Agree	Strongly Agree
1. I was able to make connections between tonight's topic and concepts I have learned in my high school courses.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Tonight's presentation helped me better understand the application of my high school mathematics and science courses to real world situations.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. It was well worth my time to attend tonight's presentation.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. I learned STEM content that was new to me tonight.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. I learned aspects of career choices that were unknown to me before tonight.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. Tonight's presentation clearly showed the integration of STEM concepts.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

SCIP STEM Session Survey	
Please complete the following statements.	
*Tonight's presentation was beneficial to me because	
<input type="text"/>	
*One suggestion I would make for the seminar series is	
<input type="text"/>	

Appendix B

SCIP Student Attitudes toward STEM Survey (modified from Tuan, H., Chin, C., & Shieh, S., (2005).)

SCIP STEM Student Attitude Survey

***Please rate how strongly you agree or disagree with each statement.**

	Strongly Disagree	Disagree	No Opinion	Agree	Strongly Agree
1. I am planning to attend a college/university or tech school in the future.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. I am planning on taking STEM courses as part of my college/university/tech program of study.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. I am planning on majoring in a STEM field at a college/university/tech school.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. I am planning on a career in a STEM field.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. I find the STEM fields to be interesting.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. I believe I have the ability to complete a STEM major in college/university/tech school.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. I believe attaining a STEM degree is worth the effort.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. I think that learning STEM is important.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. When STEM activities are too difficult, I give up or only do the easy parts.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. When learning new STEM concepts, I attempt to understand them.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11. I understand how STEM concepts can be used to solve community problems.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12. When I make mistakes in STEM classes, I try to find out why.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13. I think STEM is needed to solve the problems of today.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14. I take STEM classes because the content is exciting and fun.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15. I take STEM classes to get a higher paying job in the future.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16. I take STEM classes to get a job with many opportunities.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
17. I take STEM classes to get an important job.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
18. I take STEM classes because I want to learn to help people.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
19. I only take STEM classes to fulfill a requirement.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20. I feel safe and comfortable in STEM classes and in labs.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
21. I feel supported and encouraged to take STEM classes.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
22. I feel supported and encouraged by my community at large.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
23. I feel confident about succeeding in STEM classes this year.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
24. I feel confident that I will attain a degree in STEM when I go to college/university.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
25. I know how to handle classroom situations in which I feel a lack of support.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
26. I am comfortable working with people different from me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Thank you for completing this survey!

Appendix C

Evaluator Survey

Appendix D

References

- Tuan, H., Chin, C., & Shieh, S. (2005). The development of a questionnaire to measure students' motivation towards science learning. *International Journal of Science Education*, 27(6), 639-651.