



Achieving in Research, Math, And Science





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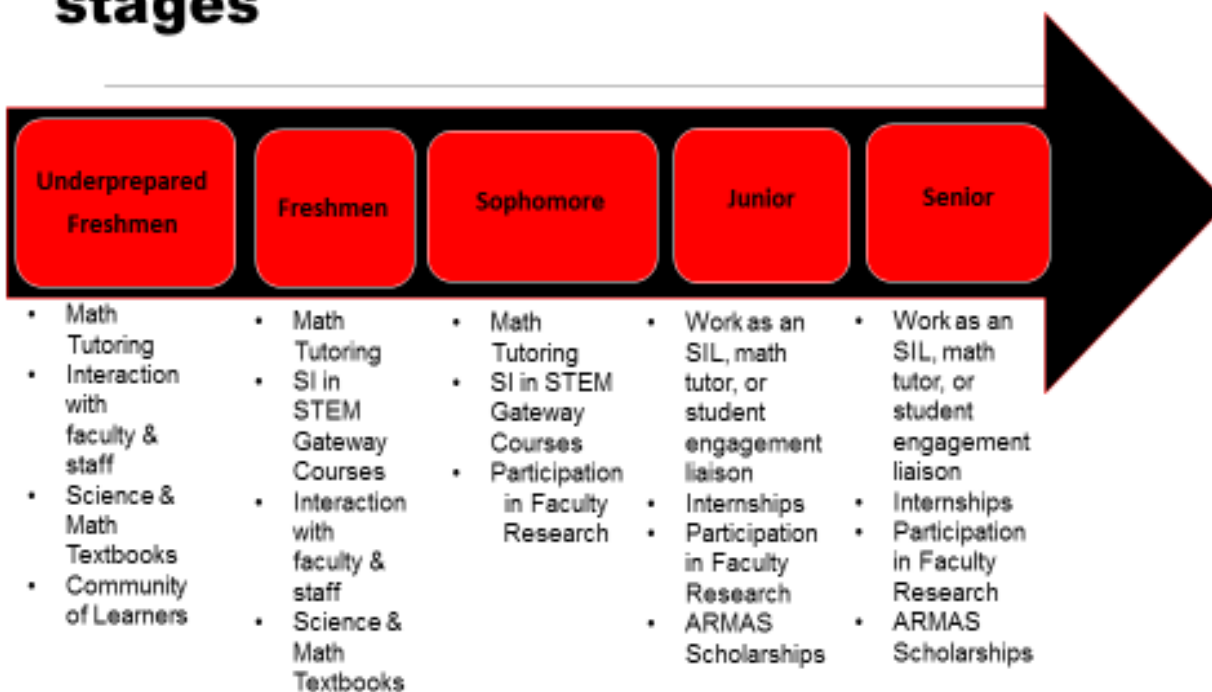
**Vision:** A diverse STEM Community capable of creating solutions to our current and future scientific challenges.

**Mission:** The mission of our center is to provide comprehensive support to Science Technology Engineering and Math (STEM) students and faculty, recognizing our historical commitment as an Hispanic Serving Institution.

## Support across stages



Achieving in Research, Math, And Science



## Emerging Principles:

- Create a welcoming space for a community of engaged STEM students & faculty
- Believe the students are serious about getting an education.
- Create connections between faculty, staff, and students.
- Believe that all “stakeholders” want the best outcomes.
- Believe in Asset-based talent development.
- Try to get to know everyone’s name and interests.
- Hire student employees so they are in an academic work environment
- Stay open in the evening.
- Provide food.
- Speak highly of the institution, the faculty and the students.
- Go the extra mile for students, staff and faculty
- Personally connect students to resources- don’t just tell them about them, send the link, make an appointment, make a call or even walk them there.
- Make study materials easy to get- free paper, an available printer, access to a computer, help getting into your computer or online class.

## Center Staff:

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Monique Esquibel, Internship Coordinator/ Center Office Specialist	505-426-2104 <a href="mailto:mesquibel@nmhu.edu">mesquibel@nmhu.edu</a>

## **Brief History of ARMAS at NMHU**

The Achieving in Research, Math and Science (ARMAS) Center opened in October 2009 with funding provided by the US Department of Education to provide support to students majoring in STEM disciplines at NMHU as well as the faculty who teach them. Given the challenges faced by many of our students, including low-incomes, deficits in academic preparation, working many hours off campus and often arriving at the university at an older age with more family obligations, the need to be able to devote time to studying and develop relationships with other students and faculty is critical for success. The ARMAS Center works to empower students to succeed through the innovative delivery of proven best practices in student and faculty support.

Located in the Engineering Building (adjacent to the Hilton Science Building), the Center has a comfortable lounge, computer lab, science textbook and educational resource area, mini-kitchen, quiet study areas and rooms for Supplemental Instruction and tutoring. It is open from 8am to 10 pm Monday-Thursday, 8 am-5 pm on Fridays and 5 pm- 10 pm on Sundays. The Center is a space where STEM students come to meet with their friends for study groups, interact with faculty and Center staff, research internship and scholarship opportunities and, most importantly, study. The sense of community that the ARMAS students and staff have built supports current students as well as draws in new STEM students who look to the upperclassmen as role models and mentors.

In a 2013 report by the Office of Institutional Effectiveness and Research, it was noted that STEM majors who participated in ARMAS were 3.8 times more likely to have graduated with STEM degrees or still be enrolled in STEM majors in the fall, 2012 semester compared to STEM majors who did not participate in ARMAS. This difference was significant at the  $p < .01$  level.

### **ARMAS Services**

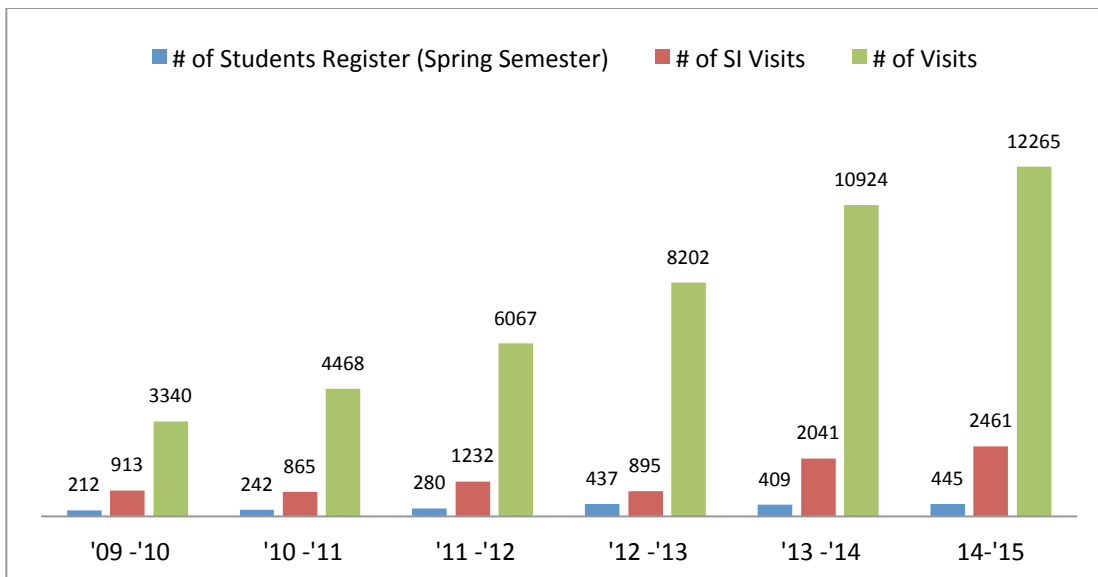
#### **ARMAS Student Support:**

- Supplemental Instruction in STEM gateway courses
- Academic coaching to support students in achieving their academic goals
- Math tutoring
- Textbook lending library
- STEM internship and research fellowship opportunities
- On-campus, academically-engaging student employment

#### **ARMAS STEM Faculty Support:**

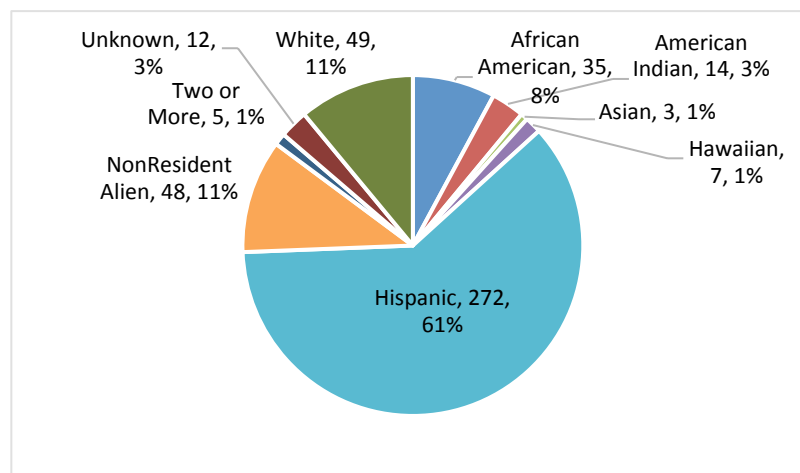
- Professional development workshops
- Training of Supplemental Instruction Leaders for STEM gateway courses
- Weekly opportunity for interdisciplinary discussions on best practices in STEM pedagogy
- Ability to provide student support services in grants requiring this aspect.



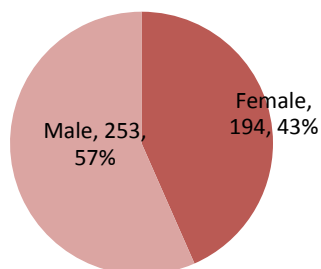


**Figure 1. Growth of ARMAS Center Utilization, 2009-2015**

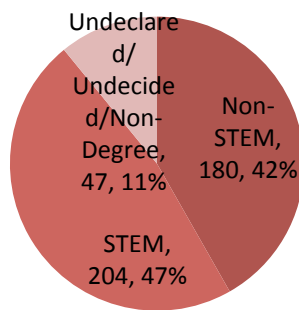
In spring 2014, the NMHU administration approved an expansion of the ARMAS Center in to accommodate the increased number of students using the Center as well as the expanded services.



**Figure 2. Spring 2015 ARMAS Registration by Ethnicity**



**Figure 3. Spring 2015 ARMAS Registration by Gender**



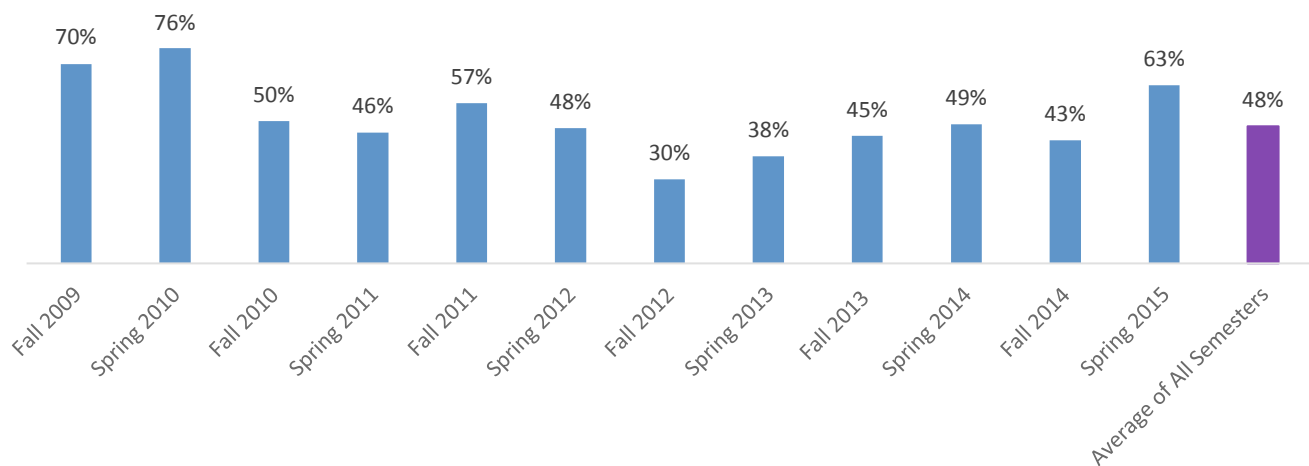
**Figure 4. Spring 2015 ARMAS Registration by Degree Type**

### Supplemental Instruction

Supplemental Instruction (SI) is an academic support model developed by Dr. Deanna Martin at the University of Missouri-Kansas City (UMKC) in 1973 that uses peer-assisted study sessions to improve student retention and success within targeted historically difficult courses. ARMAS initiated the SI in STEM gateway courses at NMHU in 2009.

#### The Essential Elements of Supplemental Instruction (SI):

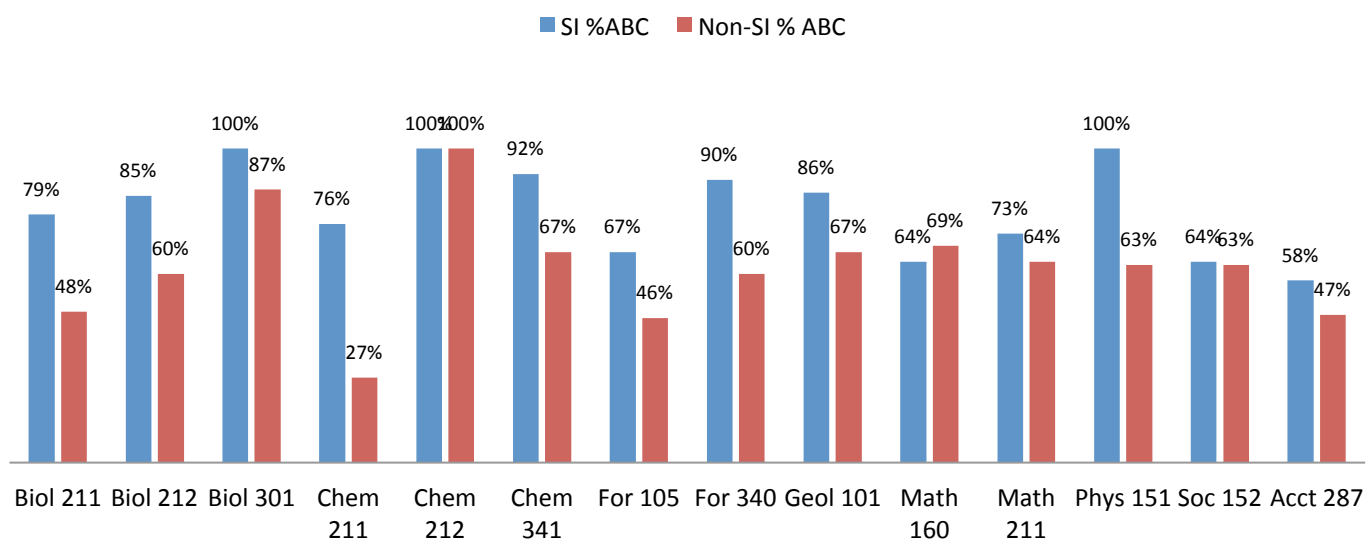
- SI targets historically difficult subjects rather than students.
- SI sessions integrate content and learning skill.
- The SI leader attends the targeted class lectures/labs.
- SI sessions are peer-facilitated.
- The SI leader serves as a model student.
- The SI leader receives weekly training.
- The SI program is closely supervised.
- Faculty support the program.
- SI employs regularly scheduled sessions.
- SI is subject to program evaluation.



**Figure 5. Percent of class attending SI support (all classes combined) by semester.**  
**Table 1. History of Courses with Supplemental Instruction at NMHU**

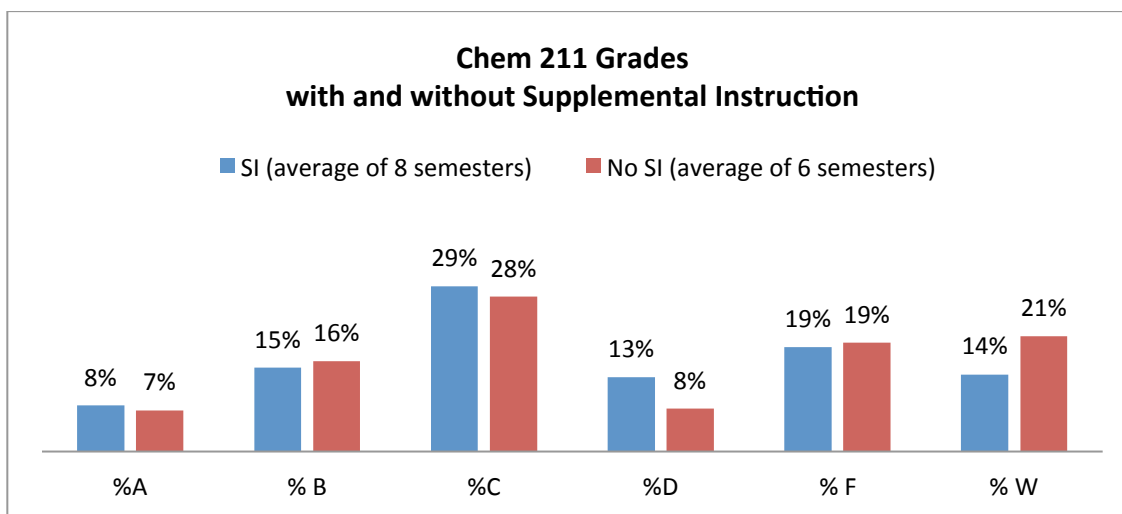
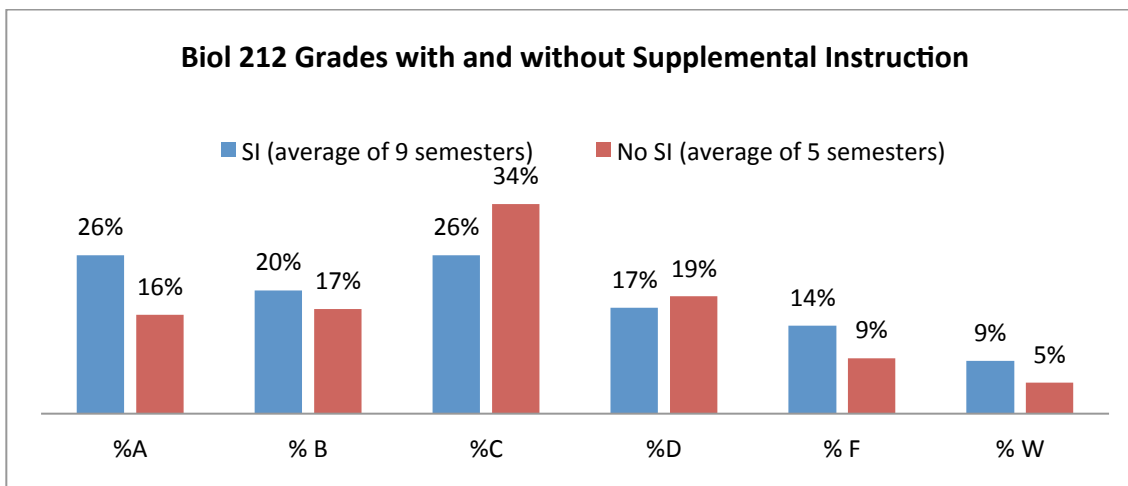
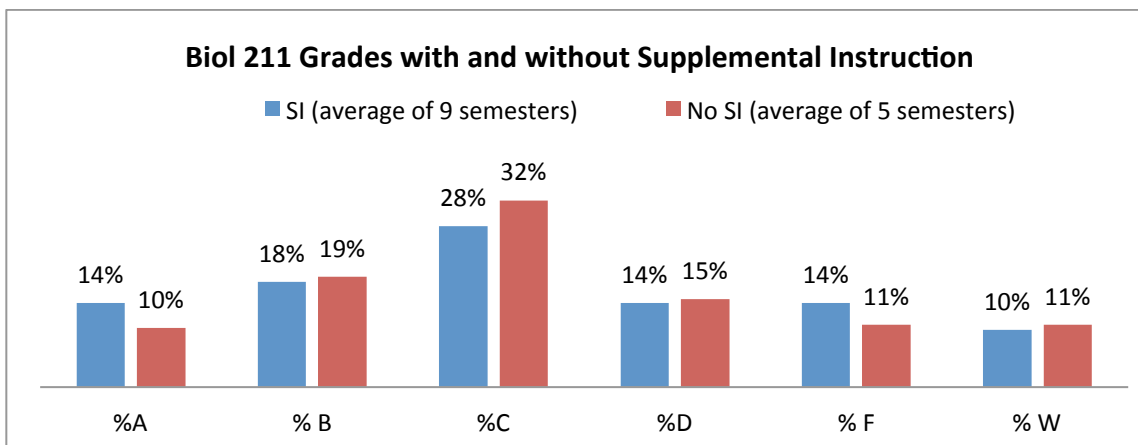
## Courses Supported with Supplemental Instruction by Semester

	Fall 2009	Spring 2010	Fall 2010	Spring 2011	Fall 2011	Spring 2012	Fall 2012	Spring 2013	Fall 2013	Spring 2014	Fall 2014	Spring 2015
Biology 211	X	X	X	X	X	X	X	X	X	X	X	X
Biology 212	X	X	X		X	X	X	X	X	X	X	X
Biology 231/232			X	X	X	X						
Chemistry 211		X	X	X	X	X	X	X	X	X	X	X
Chemistry 212			X	X	X	X	X	X	X	X	X	X
Chem 341/342				X							X	X
Phys 151		X	X	X	X	X	X		X	X	X	
Phys 152		X		X				X				X
Math 120	X											
Math 140	X	X										
Math 160		X	X					X	X	X	X	
Math 211		X	X	X					X	X	X	X
Geology 101				X	X	X	X	X	X	X	X	X
Forestry 105				X	X	X	X	X	X	X	X	X
Forestry 340									X		X	X
Econ 216							X	X		X		
Econ 217									X	X		
Soc 152							X	X X	X	X	X	
Psych 101							X	X	X			
Anth 103									X			
Acct 287/288											X	X



**Figure 6. Fall 2014 Students receiving an A,B or C by SI Attendance by Class**

## Grades in STEM Gateway Courses Before and After Implementation of SI





# Internships and Undergraduate Research Fellowships



Internships play a central role in the support of student learning. Students often find that the opportunity to utilize what they have learned in the classroom in a supervised real-world setting is exciting and rewarding. The experience often enhances the relevance of their educational programs and increases student persistence in school. While not part of the original proposal that funded the ARMAS Center, internships were included as a strategy to increase student retention and success in the second year of the program when additional funds were granted. This semester the option of conducting research with a faculty member was added to the menu of internship possibilities. The internships and undergraduate research fellowships provide a structured type of mentoring from career professionals and faculty to upperclassmen in STEM.

STEM students at Highlands are encouraged to pursue summer internships across the country however some of our students have family obligations which make it difficult to leave the area. The ARMAS Internships are designed to allow students to work with local area agencies which has the additional benefit of building stronger relationships between New Mexico Highlands University and the surrounding community.

In addition to providing internship opportunities, through the Kellogg Foundation, ARMAS has been able to fund a number of students to be Undergraduate Research Fellows early in their academic careers to work with a faculty member in their research laboratories. The Kellogg Fellows are students who are interested in pursuing a degree in a STEM discipline but arrive at NMHU underprepared for the STEM gateway classes. These students have taken a developmental science course linked with a math class and have had the opportunity to apply to work with a faculty member in their lab.

In Fall 2014, ARMAS received a two year USDA grant to provide additional internships during the semesters in the area of Natural Resources Management.

In Spring 2015, the ARMAS program began a new partnership with Los Alamos National Security and the Las Vegas First Business Alliance to provide local businesses with interns. The goal of the project is to provide experiential learning opportunities to students while supporting local small business through the provision of paid interns.

<b>Internship Placements</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>
Spring	7	2	3	7	10	15
Summer	4	9	5	13	6	14
Fall	3	5	6	6	15	TBD
<b>Total</b>	<b>14</b>	<b>16</b>	<b>14</b>	<b>26</b>	<b>31</b>	<b>29</b>

**Community Agencies & Businesses who partner with ARMAS to provide internship opportunities include:**

- El Centro Family Health Center (Information Technology Services)
- Energy Concepts Corporation
- Fort Union National Monument
- NMHU GAINS Laboratory
- Hermit's Peak Watershed Alliance
- Las Vegas Community Water Board
- Las Vegas National Wildlife Refuge
- Mora National Fish Hatchery (US Fish & Wildlife Service)
- New Mexico Behavioral Health Institute
- New Mexico Department of Transportation
- New Mexico Forest & Watershed Restoration Institute
- New Mexico State Forestry Department
- Rio Mora National Wildlife Refuge
- Rural Community Assistance Corp
- Tierra & Montes Soil & Water Conservation District
- US Forest Service, Las Vegas Ranger District
- ZGC Union County Hydrogeology

## Mentoring at ARMAS



Initially, a formal faculty/student mentoring program was proposed for the students at the ARMAS Center. As it became clear that this led to more advising than mentoring, we enlisted the Professor Emeriti to offer their services as mentors. Students seemed to prefer a more informal type of mentoring so over the past five semesters our approach to mentoring has evolved to be more individualized to the needs of each student.

Currently, mentoring is provided through several different means. Freshman and sophomores mainly receive informal peer-mentoring from the Supplemental Instruction Leaders in the STEM Gateway Courses.

The Internship Program and Undergraduate Research Fellowships provided through ARMAS creates a more formal type of mentoring from career professionals and faculty to upperclassmen in STEM. Students pursuing careers in health professions are able to job shadow local health professionals for academic credit. They receive mentoring and advice on preparing for the application process to health professional programs.

The Center Coordinator, Academic Coach, and Internship Coordinator are available to all ARMAS participants for guidance and support. Many students check in on a regular basis and receive information about scholarships, internships, and job opportunities that are tailored to their interests.

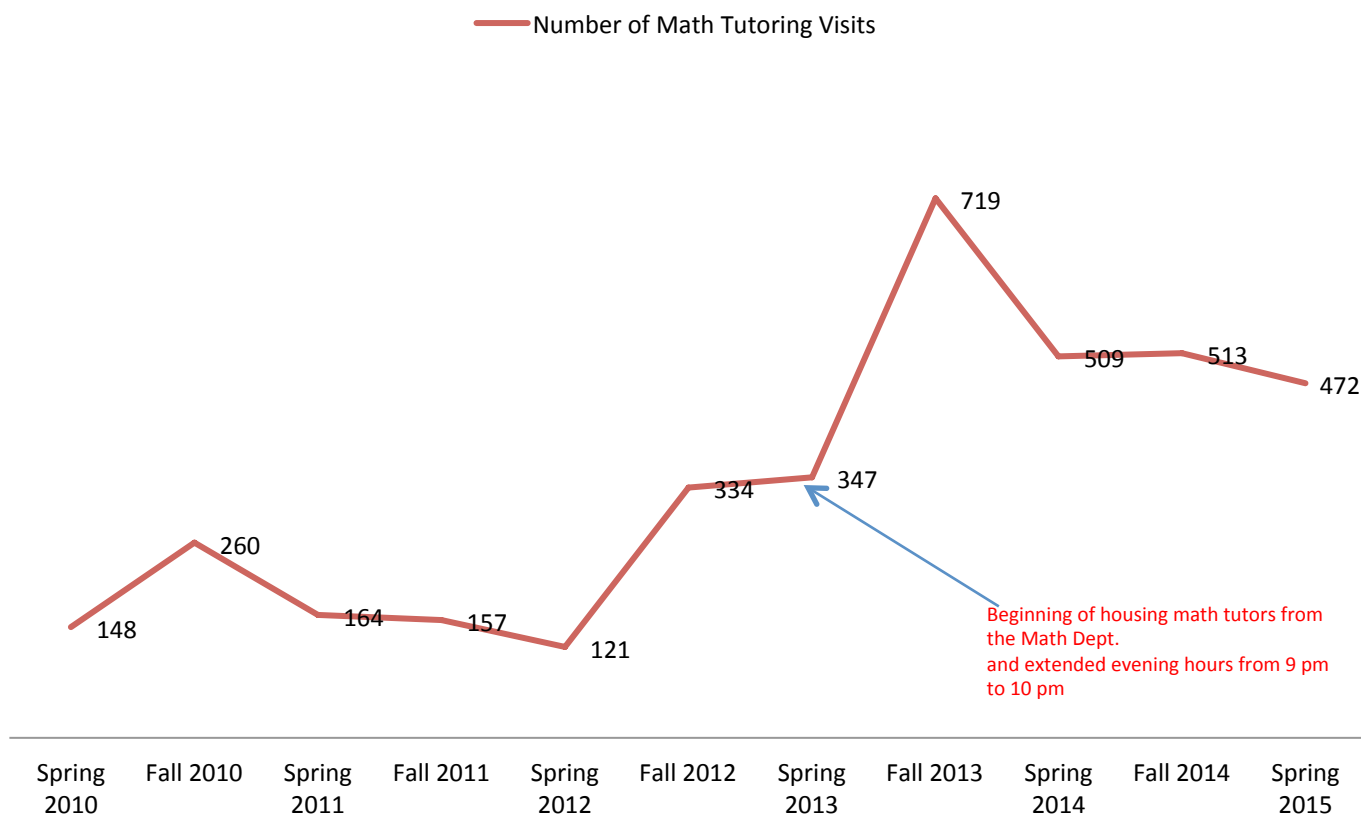
ARMAS also sponsors and co-sponsors workshops for students in partnership with faculty and other NMHU departments. Some of the workshops hosted by ARMAS include:

- Why go to Graduate School?
- Transferable Skills
- Interviewing Skills
- How to Research and Apply for Internships
- Careers and Opportunities at Los Alamos National Laboratories
- Introduction to Excel

Informal ARMAS events include Jeopardy and Pictionary Nights as well as end-of-the-semester faculty and student get-togethers.

# Math Tutoring

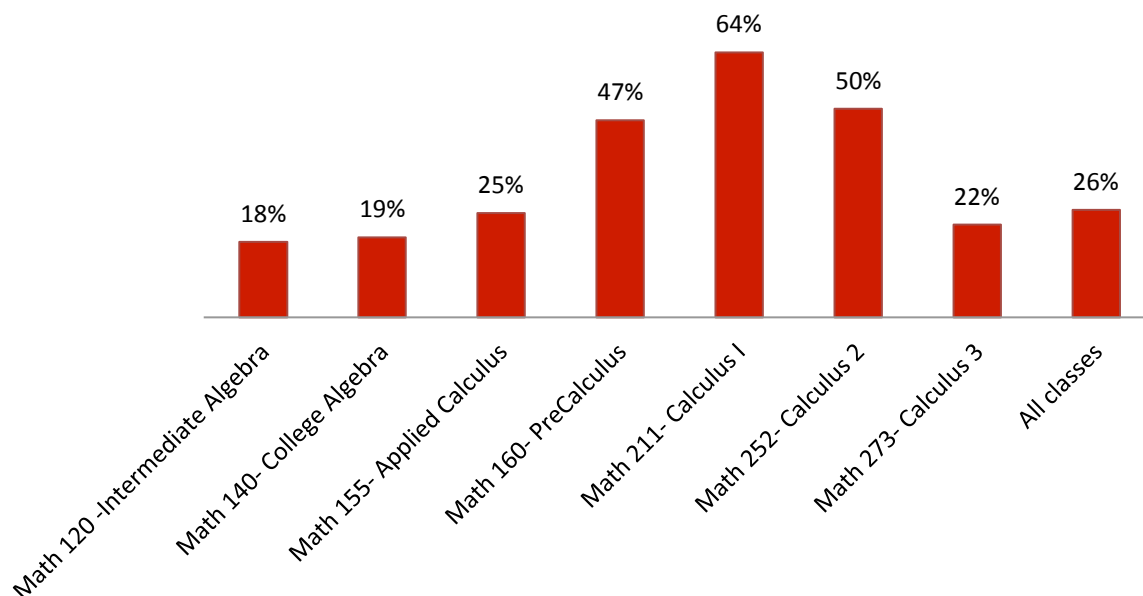
Through partnerships with the Department of Computer and Mathematical Sciences, funds from the Kellogg Foundation and Institutional support, ARMAS is able to provide math tutoring coverage for all hours that the Center is open: Monday –Thursday from 8 am to 10 pm, Friday from 8 am – 5 pm and Sundays from 5 pm – 10 pm (65 hours per week).



**Figure 7. Use of Math Tutoring at ARMAS, Fall 2009- Spring 2015**

Spring 2015 % of Students Earning an A, B, or C			
	Non-Tutoring	Tutoring	Whole Class
Math 120	52%	60%	54%
Math 140	54%	59%	55%
Math 160	45%	78%	61%
Math 211	73%	82%	77%
Math 252	54%	59%	55%





**Figure 8. Spring 2015 Math Tutoring Use by Course**

## Student Employment

Many studies of student retention demonstrate that working many hours at off campus jobs can have a detrimental effect on student retention. Recognizing the importance of financial support and on-campus employment, ARMAS has developed student employment positions that engage students further in their academic work while also providing opportunity for community building around academic material. These positions include Supplemental Instruction Leaders, Math Tutors and Front Desk Support.

**Table 3. ARMAS Student Employment Fall 2013-Spring 2014**

Student Job Position	Fall 2013	Spring 2014	Fall 2015	Spring 2015
Supplemental Instruction Leader	15	11	13	11
Front Desk Workers	9	10	8	8
Math Tutors	6	6	8	8

## **Faculty Development**

NMHU STEM faculty were surveyed and key faculty from each STEM department later gathered as a focus group to identify why students faced difficulty in completing a degree in STEM including approaches for alleviating those problems. While faculty agreed that the NMHU STEM programs are robust, they acknowledged the benefit in opportunities for expanding their familiarity with best-practice pedagogies and re-structuring curriculum to better meet the needs and interest of NMHU students.

**To be successful with students, STEM faculty require:**

- (1) knowledge of and enthusiasm for the subject matter;**
- (2) familiarity with a range of appropriate pedagogies;**
- (3) skill in using appropriate tests;**
- (4) ease in professional interactions with students within and beyond the classroom;**
- (5) active scholarly assessment in teaching and learning.**

**However, most undergraduate faculty teaching in STEM have received little formal training in instructional methodology or assessment and evaluation of student learning.**

The ARMAS Center seeks to provide leadership and training for NMHU STEM faculty to integrate active, hands-on interdisciplinary teaching into STEM education through the inclusion of real-world problem-solving in the classroom. This is done with the belief that Northern New Mexico offers an opportunity to explore a new direction in teaching while building on both the needs and strengths of some of our rural, competent and skilled but academically underprepared students.

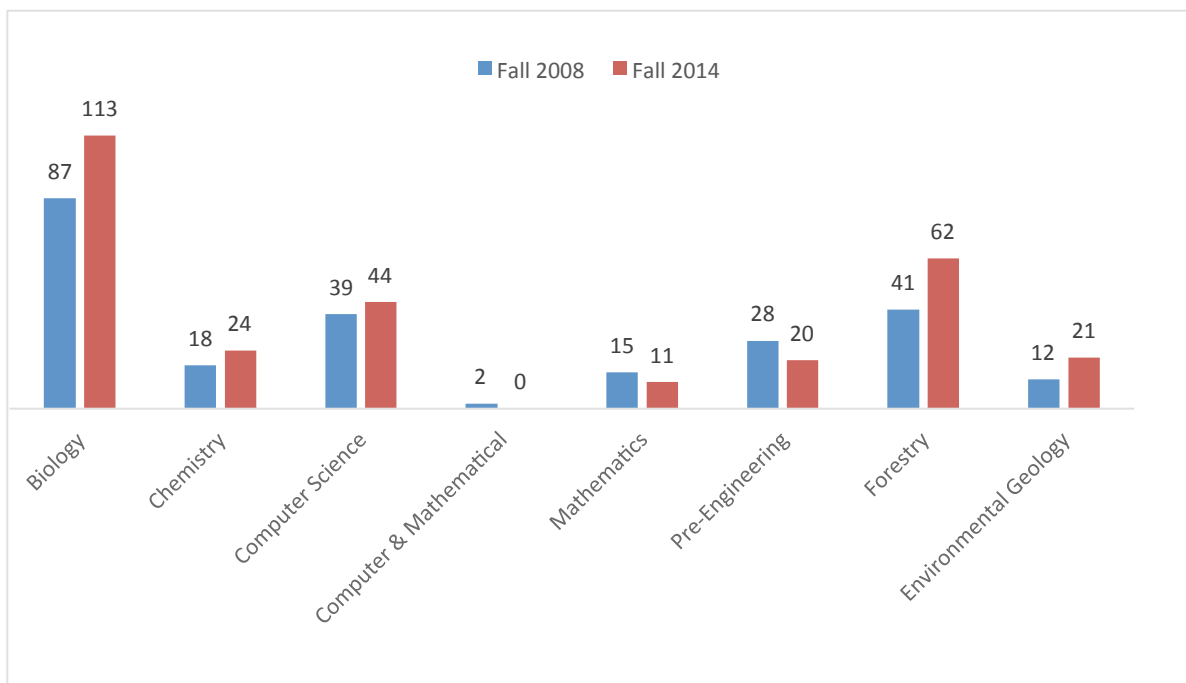
### **Faculty Development Workshops provided by ARMAS**

The ARMAS Center, in conjunction with the ACE Center at Luna Community College, has presented the following faculty development workshops that aim to increase faculty skills in working with diverse students with a wide range of academic preparation, active learning techniques and enhanced assessment and evaluation:

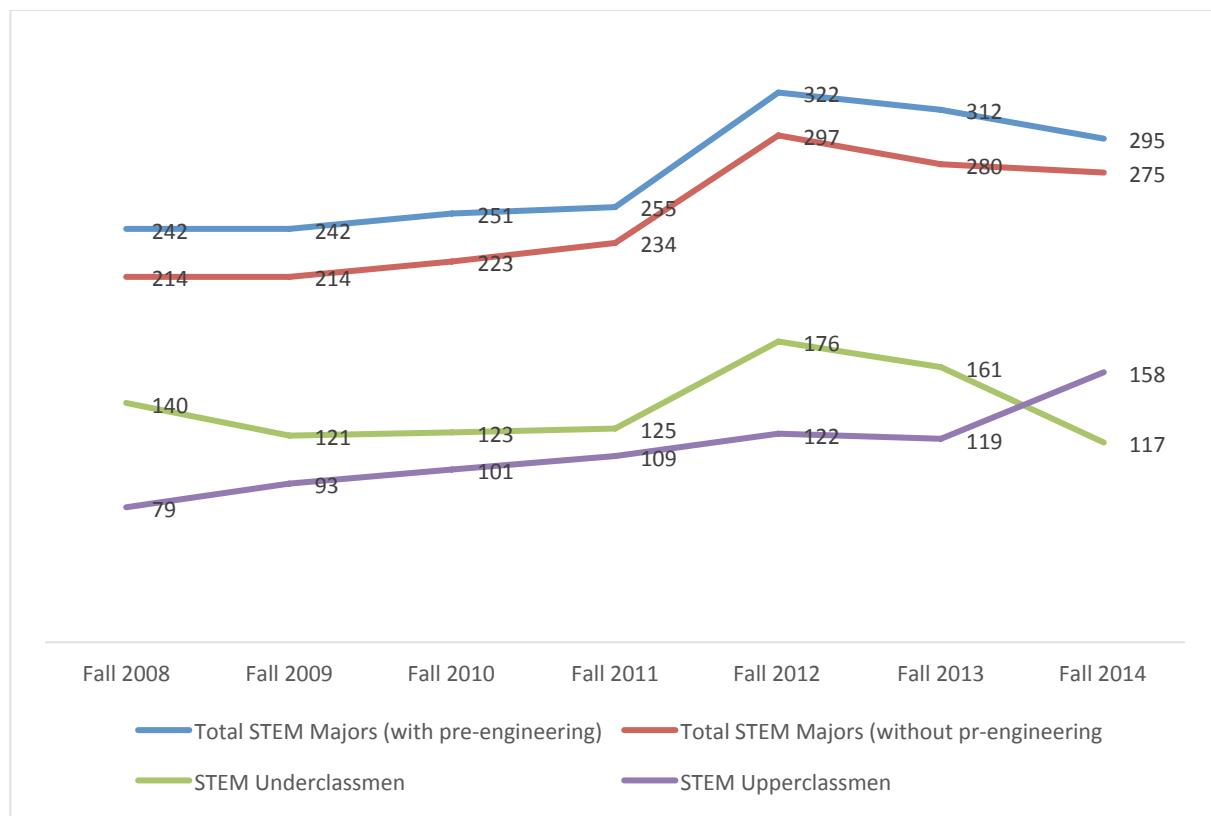
- Educating Diverse Students in an Open Enrollment Institution  
Presented by Mr. Sam Byrd, iDiversityWorks!,
- Promoting Success in the First Year  
Presented by Dr. Vincent Tinto, Syracuse University
- Designing Assessments  
Presented by Dr. Chris Nelson, NMHU School of Education
- On Course: A Festival for Learner-Centered Educators  
Presented by Professor Eileen Zamora, Faculty Emerita, Southwestern College, CA
- Who is the Keeper of Identity? Maintaining Cultural Integrity in Higher Education  
Presented by Dr. Sweeney Windchief, Asst. Dean for Diversity, Univ. of Utah Graduate School
- Supplemental Instruction Training Workshop  
Presented by Dr. Marion Stone, International Center for Supplemental Instruction, UM-KC
- Writing in the Sciences  
Presented by Dr. Barbara Risch, NMHU English Department

- Diving Deeper into Pedagogy and Educational Practices Through a Collaboratively Designed Problem-Based Assessment Process  
Presented by Dr. Peggy Maki, Higher Education Consultant
- Higher Education Benchmarking  
Presented by Dr. Jeffrey Seybert, Author of Core Effectiveness of Community Colleges
- Curriculum Mapping in Biology  
Facilitated by Mr. David Trujillo, UNM-Taos
- Backward Design  
Presented by Dr. Diane Ebert-May, Michigan State University, Dept. of Plant Biology
- On Course: A Festival for Learner-Centered Educators (3-day workshop)  
Presented by Professor Eileen Zamora, Faculty Emerita, Southwestern College, CA
- NMHU STEM Strategic Planning  
Facilitated by Dr. Eileen Zamora, Faculty Emerita, Southwestern College, CA
- Incorporating Research into Introductory Science Courses  
Presented by Dr. Vanessa Svihla, Dr. Sushilla Knottenbelt, and Dr. Martina Rosenberg  
UNM School of Education and Department of Biochemistry
- Teaching with Learning in Mind  
Presented by Dr. Melissa Salazar and Dr. Catherine Martinez-Berryhill  
Escala Education Consulting

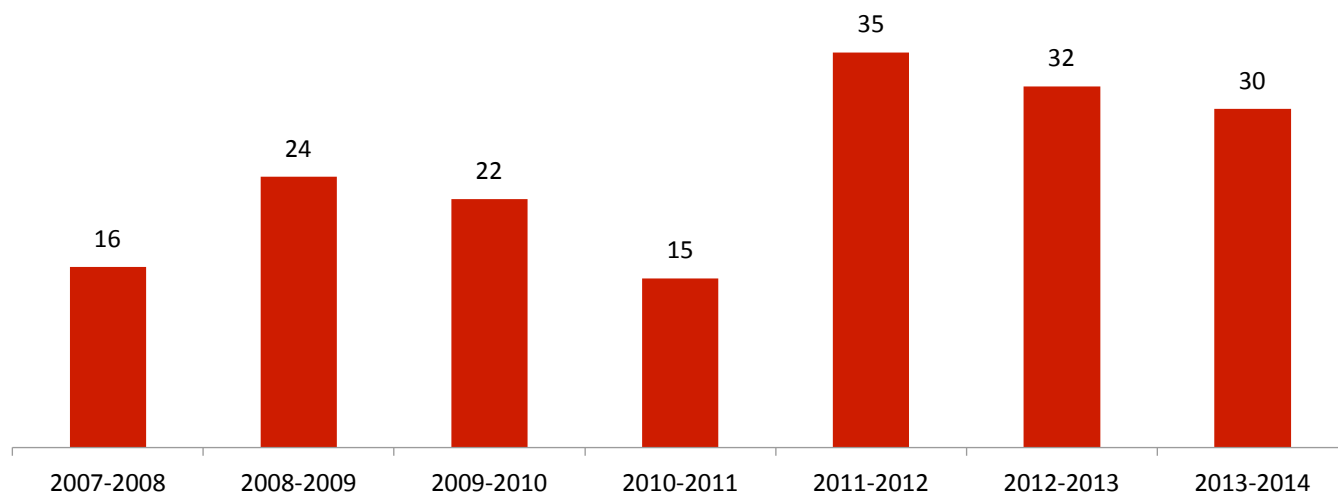
### Growth of STEM at NMHU



**Figure 9. NMHU STEM Majors, Fall 2008-Fall 2014**



**Figure 10. STEM Majors by Level, Fall 2008-Fall 2014**



**Figure 11. NMHU STEM graduates (2007-2014)**



## ARMAS Outcomes

As reported by the Office of Institutional Effectiveness and Research in April 2013

**Table 4. Retention and Graduation Rates by Major and Participation at ARMAS**

Entered Highlands and STEM since Fall 2009	Participated in ARMAS	Did Not Participate in ARMAS
	% STEM Degree or STEM enrolled	% STEM Degree or STEM enrolled
Biology	72.80%	44.10%
Chemistry	57.90%	27.30%
Computer Science	85.70%	42.10%
Mathematics	66.70%	50%
Forestry	82.10%	38.90%
Pre-Engineering	63.20%	32.40%
Environmental Geology	55.60%	57.10%
Total	72.10%	40.30%

**Table 5. OIER Reported Odds Ratio comparing ARMAS Participants and Non-Participants**

	No STEM Degree and Not Enrolled	STEM Degree or STEM Enrolled	Total	% Degree or Enrolled	Ratio of Retained/Degree vs. not Retained	
<b>No ARMAS</b>	138	93	231	40.3%	0.7	3.8
<b>ARMAS</b>	61	158	219	72.1%	2.6	
<b>Total</b>	199	251	450	55.8%		

# **ARMAS Grants**

## **Past:**

### **Department of Education, CCRAA (2008-2011)**

Award #: PO31C08004,  
\$2,097,688. (\$633,432 subawarded of to LCC)

## **Current:**

### **Department of Education, HSI-STEM (2011-2016)**

Award #: PO31C110033  
\$1,187,544 (\$308,890 subawarded to LCC)

### **National Science Foundation, S-STEM Scholarship Program (2012-2017)**

Award #: 1154471  
\$414,092

### **Kellogg Foundation (2012-2015)**

Project #: P3020826  
\$500,000

### **USDA (2014-2016), NIFA-HSI**

**\$250,000**

### **LANL, LANL Community Programs Office (Fall 2015)**

**\$50,000**

## **Additional STEM Grants that support STEM students:**

## **Past:**

**USDA SASE II-\$289,000**

**USDA FRRRE-\$290,000**

## **Current:**

**USDA GAINS- \$290,000**

**NSF, NM EPSCoR- \$613,000**

**USDA PSCP- \$186,889**

**NSF LSAMP**

## **Additional On- Campus Collaborations/Partnerships**

- NMHU Dean of Students, Wal-mart/HACU Grant ( Support for non-STEM SIL)
- NMHU Career Services
- NMHU Department of Computer and Mathematical Sciences
- NMHU Office of Academic Support
- NMHU Student Support Services
- NMHU Office of Institutional Effectiveness and Research
- NMHU Office of Research & Sponsored Projects
- NMHU Foundation