SmartStart Evaluation SmartBrief

2014-15 Trimester 3: April 1 – July 31 2015

Western Consortium for Watershed Analysis, Visualization, and Exploration (WC-WAVE)

The National Science Foundation (NSF) awarded a Track 2 EPSCoR (Experimental Program to Stimulate Competitive Research) to the states of Idaho, Nevada, and New Mexico for the Western Consortium for Watershed Analysis, Visualization, and Exploration (WC-WAVE) project. The 3-year grant supports the multi-state consortium model, which increases opportunities for scientific collaboration and enhances each state's ability to secure competitive funding and undertake complex watershed science research. The mission of the NSF EPSCoR program is to "strengthen research and education in science and engineering throughout the United States and to avoid undue concentration of such research and education." [1]

Project Components

Component 1: **Watershed Sciences -** Advance understanding of hydrologic interactions and their impact on ecosystem services using a virtual watershed (VW) framework.

Component 2: **Cyberinfrastructure (CI) Visualization -** Accelerate collaborative, interdisciplinary watershed research and discovery by creating innovative visualization environments.

Component 3: **Cyberinfrastructure Data -** Accelerate data management systems, visualization, model configuration; enable access to research products and data; and streamline data intensive research.

Component 4: **Workforce Development** - Engage faculty and students in interdisciplinary team-based watershed research.

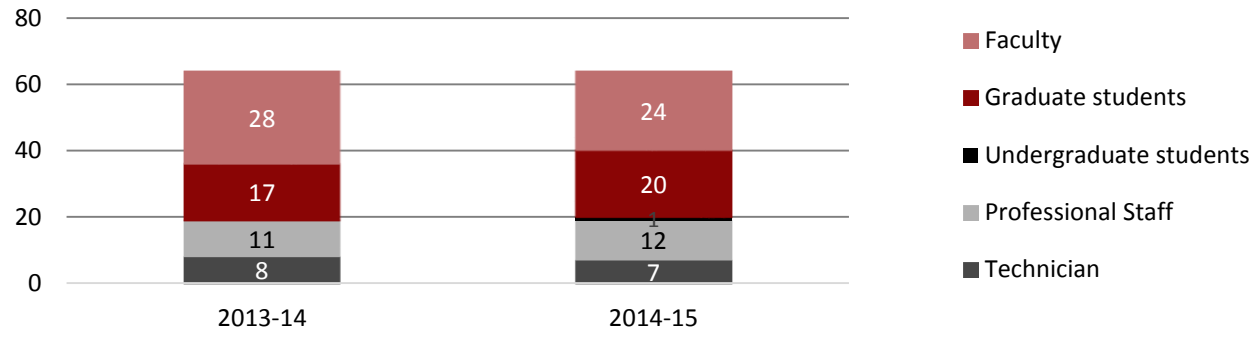
The table below shows all of the components and activities that are part of the WC-WAVE project.

Watershed Science Research	Cyberinfrastructure Visualization and Data	Workforce Development/Education
• Hypothesis driven collaborative research activities • Model runs with students • Experiential field teaching and learning for students and faculty (Snow Camp, Summer Institutes) • Dissemination of findings and products • Planning and discussion about sustainability of research activities	• Ongoing gathering of data and model requirements and user expectations • Analysis of data and feedback to cyberinfrastructure leads on end users' needs • Workshops for faculty and students on effective use of the visualization environment and data management • Planning and discussion about sustainability of CI that is being developed	• Interdisciplinary training of graduate students (GIT) • UVMN cohort 1 and 2 • UVMN capstone event • Undergraduate modules • Diversity of participation • Planning and discussion about sustainability of activities

[1] http://www.nsf.gov/od/oia/programs/epscor/about.jsp

WC-WAVE Project Participants

Sixty-three faculty, students, professional staff, and technicians participated in the 2013-14 WC-WAVE project and six additional participants joined the project in 2014-15: three graduate students, two professional staff, and one undergraduate student. The breakdown of project participants' roles by year are below. Faculty compose the majority of project participants.



Evaluation Overview

Three types of evaluation are conducted for this project: a front-end evaluation to assess program needs and assist with organization and planning, a formative evaluation to monitor implementation of the project components and provide feedback, and a summative evaluation to assess achievement of project components and broader impacts.

Assessment Development

SmartStart has developed the following assessment instruments for the Tri-State WC-WAVE project:

- Evaluation forms for all project activities seminars, workshops, and meetings
- Project baseline/post-survey
- Pre-/Post- content test development with program coordinators for specific activities
- Program Sustainability Assessment Tool (PSAT)[2]
- Focus group and interview question and protocol development

Data Collection and Analysis

Participants complete paper or online workshop and meeting evaluation forms at the end of each workshop or meeting. Project baseline and post-surveys are posted on www.surveygizmo.com and a link is sent to project participants' email addresses. Quantitative results are analyzed using SPSS software. Results of workshop and meeting evaluations and the baseline survey are analyzed using means and response frequencies. Likert scale results of project baseline/post surveys are analyzed using paired t-tests and ANOVAs to measure gains that can be attributed to participation. Responses to open-ended questions are coded for themes. Qualitative results of focus group and interview responses are analyzed using NVivo software to identify.

Evaluation Brief Content

Virtual Meeting
WC-WAVE Summer Meeting
Undergraduate Visualization and Modeling Network (UVMN)
Interdisciplinary Modeling Course

Virtual Meeting

WC-WAVE component leads organized and facilitated an on line virtual meeting which was held on April 10, 2015. Twenty six attendees (41% of project participants) used an internet connection and web camera to attend the meeting online. All project participants were invited to attend.

Demographics (n=26)

Meeting attendees were predominantly Caucasian and Asian and both genders were equally represented. Half of all attendees were faculty and over one-third (38%) were involved with UVMN.

Gender

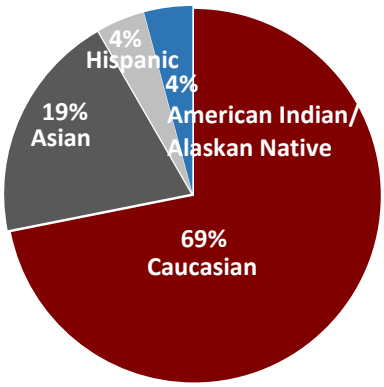
50%

50%

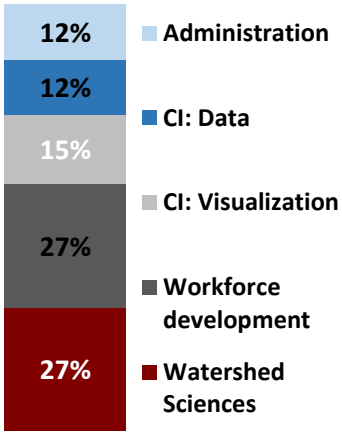
38%

Involved with **Undergraduate Visualization and Modeling Network**

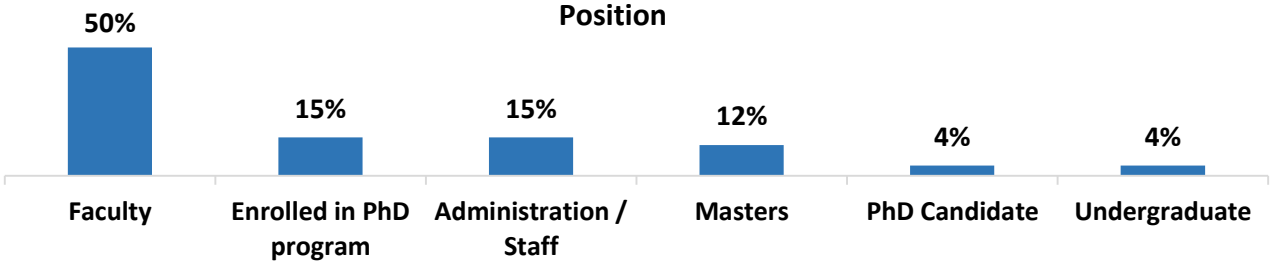
Ethnicity



Project

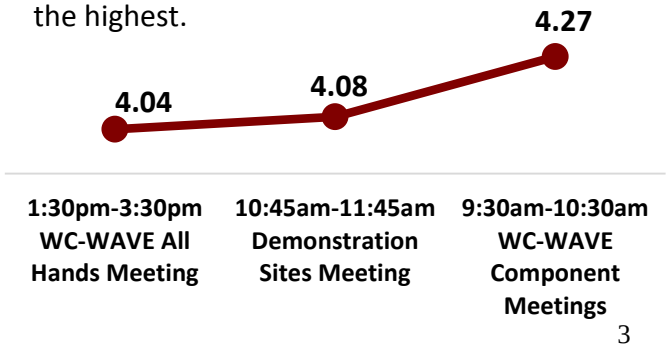


Position



Sessions

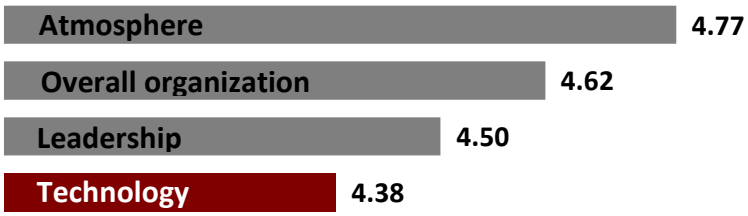
Participants rated the three sessions on a scale of 1 to 5, 1= *not useful at all;* 5 = *extremely useful.* All three sessions were rated *very* to *extremely useful* with *Component meetings* rated the highest.



"More time in team and demo sessions allows for greater small group interaction, including students. Two hours seemed enough as a large group."

Logistics

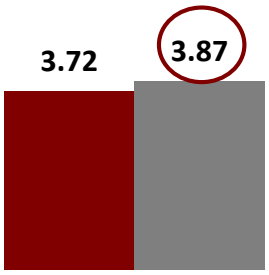
Participants rated their satisfaction with meeting logistics on a scale of 1 to 5; 1 = *completely satisfied,* 5 = *not at all satisfied*. Participants were most satisfied with the *atmosphere* of the meeting and least satisfied with the quality of the *technology.*



"Our afternoon connection often paused and skipped …"

Impact

Participants rated their level of achievement of meeting objectives before and after participation in the meeting on a scale of 1-5, 1=*minimal* to 5=*extensive*. Participants' mean ratings show a small, but statistically significant ($p<.05$) increase on the reflective pre/post survey for the composite, but not for the individual items.



Overall ratings of all statements

Statistically significant overall gain, but not for individual items

Items that make up overall Impact Composite	Pre	Post	Significant
My knowledge of Tri-State research components.	**3.80**	**4.10**	
My opportunities to work on/refine my own projects with my team member(s) and/or mentor(s).	**3.70**	**3.90**	
My knowledge of cutting-edge CI/Data/Visualization resources.	**3.80**	**3.80**	
My feeling of connection to the research community through participation in meeting and poster sessions.	**3.40**	**3.60**	
My interaction with watershed and CI/Data/Visualization personnel.	**4.20**	**4.20**	
My exposure to options for incorporating Tri-State research products into undergraduate resources.	**3.40**	**3.60**	

Key Findings

- Participants rated all three sessions *extremely useful*.
- Participants were *completely satisfied* with meeting logistics.
- Although the overall composite rating of all objective statements showed a statistically significant increase, none of the six individual items did.

WC-WAVE Summer Meeting

The WC-WAVE Summer Meeting was held for one day on June 2, 2015 in the Boise State University Student Union in Boise, Idaho for all project participants. The meeting was held concurrently with the Undergraduate Visualization and Modeling Network Workshop and Interdisciplinary Modeling Course, so attendance varied at each session.

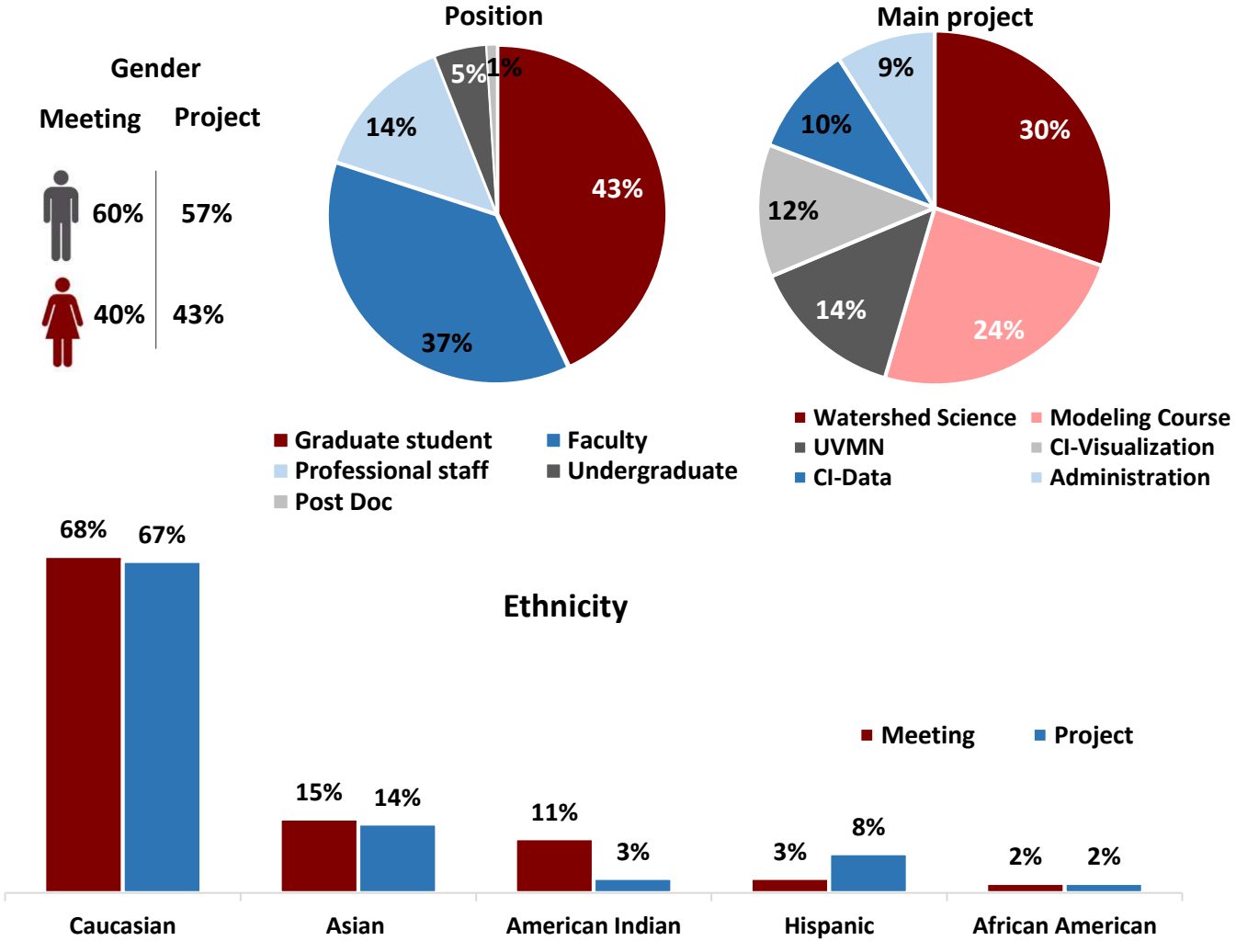
Meeting's objectives:

- **Increase knowledge of the project's research findings and outcomes**
- **Increase ability to collaborate and discuss the project with colleagues**
- **Increase knowledge of upcoming activities**

Demographics (n=64)

The evaluator notes the following differences compared to overall project participants:

- American Indians and African Americans are well-represented
- Females and Hispanics are underrepresented



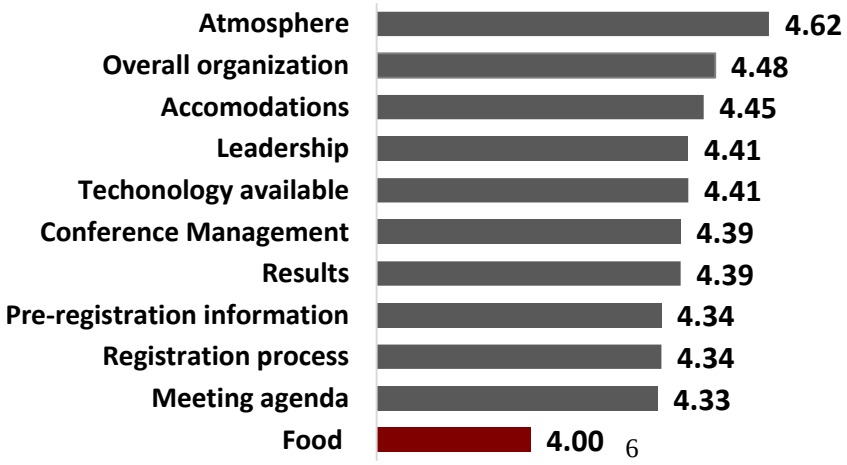
Meeting Sessions

Participants rated the usefulness of meeting sessions on a scale of 1 to 5; 1 = *not useful at all;* 5 = *extremely useful.* The *Watershed Demonstration projects* received the highest ratings while the *Management Team Work Groups* were the lowest rated. Multiple comments indicated a need for better planning for the concurrent activities (Field Trip, Meeting Sessions, and the Interdisciplinary Modeling Course).

Session	Mean rating	# of attendees
June 2, 2015		
(8:45am-10:15am) Watershed Demonstration Projects	**4.45**	**55**
(5:30pm-7:00pm) Dinner Speaker	**4.38**	**53**
(2:15pm-3:15pm) Demonstration Site Working Groups	**4.36**	**36**
(1:00pm-2:15pm) Component Working Groups	**4.33**	**39**
(3:15pm-3:45pm) Networking Break-Afternoon	**4.29**	**42**
(10:15am-10:45am) Networking Break-Morning	**4.26**	**54**
(5:00pm-5:30pm) Networking Break-Evening	**4.24**	**46**
(10:45am-11:30am) Identifying Cross-Cutting Needs/ Opportunities Structured Discussion	**4.13**	**54**
(8:30am-8:45am) Opening and Welcome	**4.11**	**54**
(3:45pm-4:45pm) Report Out by Component and Demonstration Site	**4.07**	**44**
(1:00-5:00) Interdisciplinary Modeling Course Student Tour	**4.06**	**18**
(4:45pm-5:00pm) Concluding Remarks	**4.02**	**46**
(11:30am-11:45am) External Evaluation	**3.70**	**50**
June 3, 2015		
(8:30am-6:00pm) Reynolds Creek Experimental Watershed field trip	**4.00**	**11**
(8:00am-5:00pm) Management Team Work Groups	**3.17**	**12**

Meeting Logistics

Participants rated satisfaction with meeting logistics on a scale of 1 to 5; 1 = *completely satisfied,* 5 = *not at all satisfied*. They were most satisfied with the *atmosphere* of the meeting and least satisfied with the *food*. Comments indicate some participants found the multiple registration information and schedules for the summer meeting, UVMN, and the Interdisciplinary Course to be confusing. Participants would like more healthy options, such as fruit and protein, for breakfast as well as less cold air in the meeting rooms.



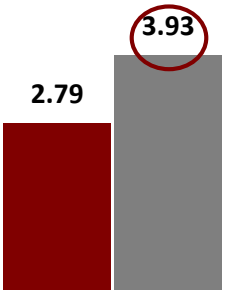
"Having 3 different registration things coming at me with "don't listen to the others... listen to me" in them was a bit confusing..."

"Breakfast should include some healthy choices. Too many carbs ..."

Impact

Participants rated their level of achievement of meeting objectives before and after participation in the meeting on a scale of 1-5, 1=*minimal* to 5=*extensive*. A circle around the average on the post bar represents statistically significant change.

Participants' mean ratings show a statistically significant ($p<.05$) increase on the reflective pre/post survey for all objectives. Overall, participants expressed greatest gain in knowledge about *the project's research findings and outcomes*.



Overall ratings of all statements

"It's only been a few months since (the last meeting) and I felt both of those even more at this meeting - overall progress and more cohesion."

Survey Item	Pre	Post	Significant
My knowledge of upcoming activities.	**2.81**	**3.98**	✓
My knowledge of the project's research findings and outcomes.	**2.72**	**3.97**	✓
My ability to collaborate and discuss the project with colleagues.	**2.84**	**3.97**	✓

Key Findings

- Americans and African Americans were well-represented; Females and Hispanics were underrepresented.
- 13 out of 15 sessions rated *extremely useful*. The lowest rated item was *Management Team Work Groups*. Participants recommend not scheduling multiple concurrent activities-it resulted in confusion and overall lower attendance. They also suggested Day 1 was too long and that more informal collaboration time is needed. In addition, some IMC and UVMN participants were unsure about whether they can attend other WAVE events/classes/field trips.
- Participants were *very* to *completely satisfied* with all logistics. *Food* was the lowest rated item, and comments asked for more healthy food options.
- Statistically significant gains for all objectives.

Undergraduate Visualization and Modeling Network (UVMN)

The UVMN provides professional development for faculty and students from Primarily Undergraduate Institutions (PUIs) in the three consortium states. The UVMN program is an opportunity to engage diverse students in undergraduate research and cyberinfrastructure-enabled education by providing lectures and hands-on opportunities that allow students to practice their modeling skills. UVMN was held June 2-5, 2015 at Boise State University.

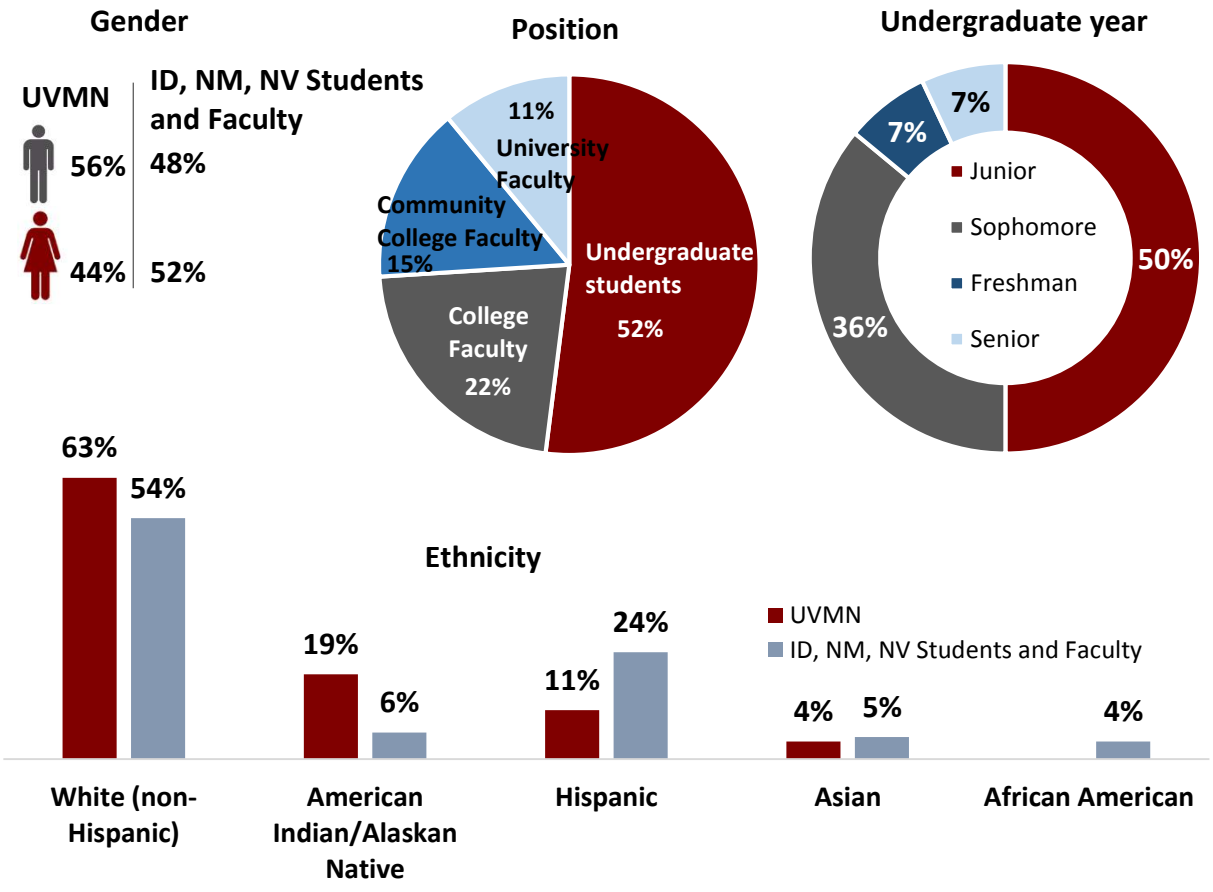
UVMN program objectives:

1. **Increase knowledge of and proficiency with various modeling and visualization tools and resources presented in the UVMN workshops.**
2. **Increase skills in the integration of modeling and/or visualization in undergraduate science, technology, engineering, mathematics (STEM) courses at primarily undergraduate institutions.**
3. **Increase interest in and commitment to continue studying modeling and visualization**

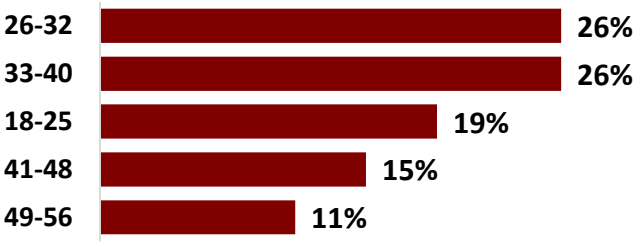
Demographics (n=27)

The evaluator notes the following differences with respect to the comparison population:

- American Indians were well represented
- Women, Hispanics, and African Americans were underrepresented



Age



48% are first-generation college students

26% also attended UVMN in 2014

Institutional Affiliation

Idaho:	**25%**
Lewis-Clark State College	11%
University of Idaho	7%
College of Western Idaho	7%
Nevada:	**33%**
Nevada State College	11%
Sierra Nevada College	7%
Nevada System of Higher Education	7%
University of Nevada, Reno	4%
Truckee Meadows Community College	4%
New Mexico:	**40%**
Navajo Technical University	15%
New Mexico Highlands University	7%
Mesalands Community College	7%
Southwestern Indian Polytechnic Institute	7%
Luna Community College	4%

UVMN Faculty Experience

UVMN faculty provided additional details about their teaching experience, including years of experience, department name, research conducted, and courses taught.

Experience teaching courses related to UVMN content:

23% Geographic Information Systems (GIS)

23% Computer modeling/statistics

15% Cartography

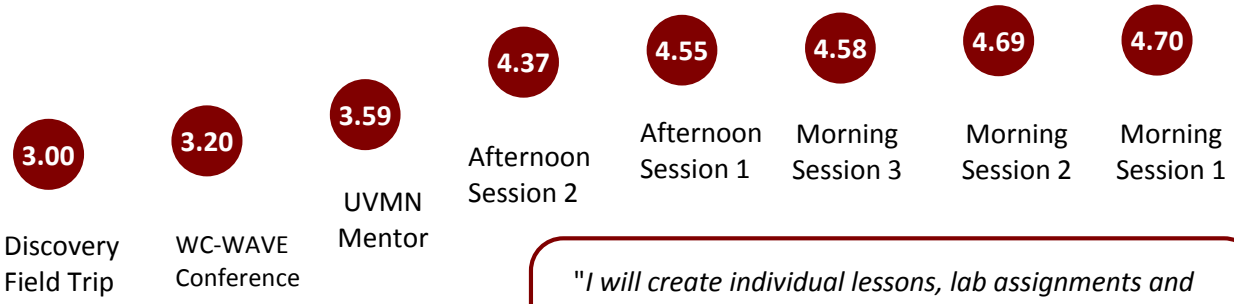
Average years teaching experience:
5.7 years
Range of teaching experience:
1-19 years

Department	Research	Teaching Experience	
Natural Sciences	Drought effects on area lake, sustainability, natural sciences, andragogy, water quality/learning communities	▪ Intro Learning Strategies courses ▪ Leadership ▪ Intro Natural Sciences ▪ Service-learning, experiential education trainer for UI courses ▪ TA for Geography courses ▪ Outdoor Science school ▪ Museum Science	▪ Environmental Science ▪ Research and Presentation ▪ Meteorology ▪ American Politics ▪ Engineering classes ▪ Intro Earth Science ▪ GIS ▪ Introduction to Science
Chemistry	Land air and water resources	▪ Essentials of Organic and Biochemistry ▪ Liberal Arts Chemistry	▪ General Chemistry
Environmental Science	Environmental Science	▪ Intro Environmental Science ▪ Biodiversity and Conservation ▪ Environmental Pollution ▪ Introduction Biology I & II	▪ Human Anatomy and Physiology I & II ▪ Ecology ▪ Applied Ecology and Management
Mathematics, Engineering, Technology	Water Studies	▪ Introduction to Cartography ▪ Introduction to GIS I & II ▪ Remote Sensing	▪ GIS Software Applications ▪ Service Learning Project ▪ Database Query

Department	Research	Teaching Experience	
Natural Resources Management	Watersheds, Fire	▪ GIS ▪ Remote Sensing	▪ Map/Image Interpretation
Physical science	Soils	▪ Geology 101 ▪ Soils	▪ Intro Environmental Science ▪ Pollution
Physical and Life Sciences	Aquatic ecology	▪ Freshwater Studies ▪ Principles of Biology I & II ▪ Cell Processes ▪ Bacterial Physiology	▪ Microbiology ▪ Intro Environmental Science ▪ Bioinformatics
Science	Climate Change	▪ Hydrology ▪ Environmental Science ▪ Natural Resources Management	▪ Environmental Law ▪ Range Management ▪ NEPA
Science and Technology	Earth Sciences	▪ Environment Sciences ▪ Environmental Science ▪ Stream Ecology ▪ Aquatic Ecology ▪ Environmental Engineering ▪ Earth Sciences	▪ Geology ▪ Hydrology ▪ Meteorology ▪ Climate Change ▪ Environmental Geochemistry ▪ Outdoor Leadership ▪ Environmental Interpretation
Social Sciences	Agricultural History	▪ U.S. History ▪ World History ▪ Public History	▪ Remedial English ▪ Remedial Math ▪ English as a Second Language

Ratings of workshop sessions

Participants rated the usefulness of workshop sessions on a scale of 1 to 5, 1=*not useful at all* to 5=*extremely useful*. Most sessions were rated *very* or *extremely useful*. Only a small number participated in the low-rated *field trip* and conference sessions. Participants request more information in advance on the logistics of the service learning' field trip.

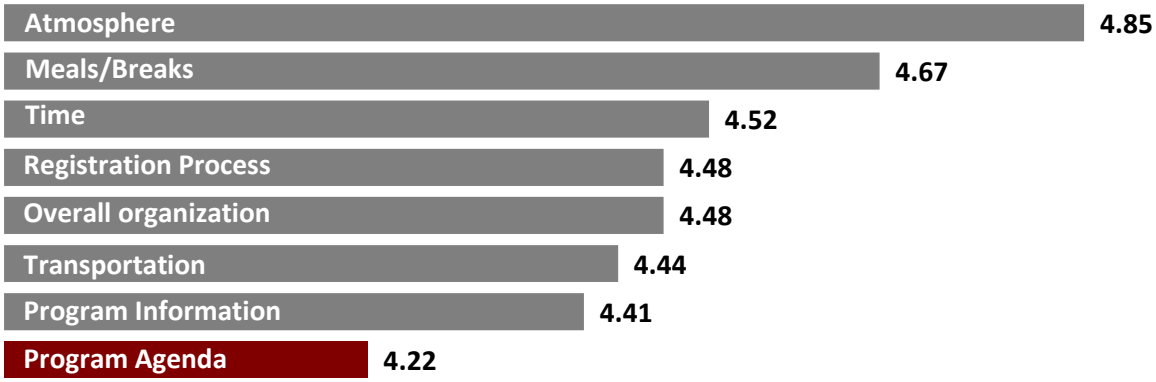


"*I will create individual lessons, lab assignments and workshops based on the content provided at the workshop. I will develop a project to interpret some nearby landscape features.*"

"I will incorporate many aspects of Google Earth including looking at historic satellite data, importing images, and creating virtual tours. I will be experimenting more with QGIS and once I become more comfortable with that program, I may be incorporating that into classes as well."

Workshop Logistics

Participants rated their satisfaction with eight logistical aspects of the workshop on a scale of 1 to 5, 1=*not at all satisfied* to 5=*extremely satisfied*. Overall, participants were *extremely satisfied* with all logistics.

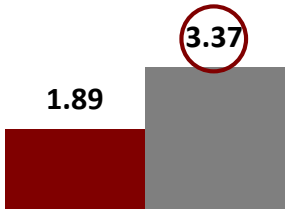


Impact

Objective 1 - Increase participants' knowledge of and proficiency with various modeling and visualization tools and resources presented in the UVMN workshops.

Objective 2 - Increase participants' skills in the integration of modeling and/or visualization in undergraduate science, technology, engineering, mathematics (STEM) courses at primarily undergraduate institutions.

Participants rated their level of achievement of workshop objectives before and after participation in the workshop on a scale of 1 to 5, 1=minimal and 5=extensive. A circle around the average on the post bar represents statistically significant change.



Learning Objectives

"I will use several of the new tools, such as GIS, Google Earth, and others to assist me in my research, classes, learning, and understanding of the way our natural world works."

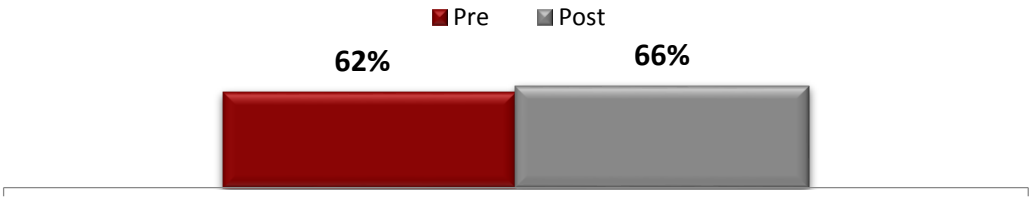
Survey Item	Pre	Post	Significant
Use of Google Earth	**2.78**	**4.30**	✓
Ability to learn about open source GIS and free GIS data	**1.89**	**3.85**	✓
Basic GIS knowledge	**2.41**	**3.70**	✓
Ability to create and handle KML/KMZ files	**1.89**	**3.56**	✓
Ability to model and visualize surface hydrology	**1.74**	**3.37**	✓
Use of QGIS	**1.41**	**3.33**	✓
Knowledge about data to create 3D and terrain models and orthomosaics	**1.96**	**3.30**	✓
Hydrological modeling	**1.96**	**3.30**	✓
Creating Virtual Tours	**1.56**	**3.26**	✓
Knowledge of techniques to create 3D and terrain models, and orthomosaics	**1.78**	**3.07**	✓
Use of Microsoft Kinect	**1.78**	**3.04**	✓
Use of aerial drones	**1.81**	**2.96**	✓
Structure from Motion	**1.63**	**2.74**	✓

Pre-/Post- Content Test Results

The pre-/post- content test was initially developed in 2014 by the three UVMN workshop facilitators over several iterations to assess actual gains in knowledge and skills. The seventeen content questions specifically measured growth in visualization and modeling knowledge acquired at the workshop. For 2015, additional survey changes were made at the request of the instructors and the New Mexico EPSCOR Associate Director. The following categories of information were represented on the survey.

- Cartography
- Visualization
- Gigapans
- Measurements
- LiDAR
- Geographic Information Systems (GIS)

The percent of correct responses on the pre- and post-content test reported by all participants is shown below.



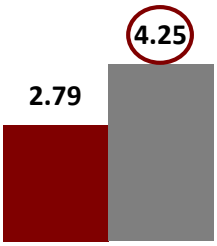
The evaluator analyzed the six content and skill topic areas individually that are included in the composite to show the amount of growth in each of the specific topics so program coordinators better align future programs with participants' needs. Results are shown in the table below. Post scores did not increase significantly and are still fairly low. Questions and responses are grouped by topic. Students' scores generally increased from pre- to post- survey, but only minimally.

Results indicate an overall knowledge increase of 1 percentage point between the pre- and post- surveys. Workshop participants' knowledge increased on four areas (*Cartography, Gigapans, LiDAR,* and *Geographic Information Systems*) but decreased on two areas (*Visualization* and *Measurements*). This indicates a greater need for instruction in these areas during the next UVMN workshop.

Content categories	% Correct Pre	% Correct Post	Change in percentage points
Cartography	67%	73%	+6
Visualization	78%	67%	-11
Gigapans	62%	75%	+13
Measurements	67%	59%	-8
LiDAR	70%	79%	+9
Geographic Information Systems (GIS)	39%	43%	+4
Average Scores	64%	65%	+1

Objective 3 - Increase participants' interest in and commitment to continuing studies in modeling and visualization

Results of UVMN Workshop participants' ratings of their interest in and commitment to modeling and visualization are shown below. Overall, participants demonstrated statistically significant gains in their interest in and commitment to modeling and visualization.

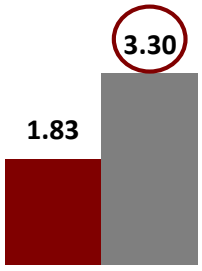


Overall ratings of all statements

Survey Item	Pre	Post	Significant
My commitment to continue studies and/or professional development in modeling visualization.	**2.93**	**4.33**	✓
My interest in working on Visualization/Modeling science projects.	**3.11**	**4.33**	✓
My ability to exchange ideas about modeling and visualization with other WC-WAVE Consortium participants.	**2.33**	**4.07**	✓

Overall learning

Participants' ratings of their overall learning are shown below. Participants demonstrated statistically significant gains in their overall learning.



Overall ratings of all statements

Survey Item	Pre	Post	Significant
My ability to exchange ideas on teaching topics/develop my curriculum with other WC-WAVE Consortium faculty. (faculty only n=11)	**2.00**	**4.00**	✓
My familiarity with the WC-WAVE Consortium faculty and students.	**1.89**	**3.70**	✓
My knowledge of the Jemez watershed project field site.	**1.67**	**2.56**	✓
My ability to develop my dissertation committee from WC-WAVE faculty (students only n=16)	**1.88**	**2.56**	✓

Key Findings

- American Indians were well represented; Women, Hispanics, and African Americans were underrepresented.
- All *Morning* and *Afternoon sessions* were rated *extremely useful* and the *Mentor Mixer* was rated *very useful.* However, the *Discovery Field Trip* and *WC-WAVE Conference* were low-rated and poorly attended. Comments suggest extending the course to one week due to the overabundance of information presented.
- Participants *extremely satisfied* with all logistics.
- There were statistically significant gains on all objectives.
- Overall, there was a slight pre- to post increase on the content survey. However, there was a pre- to post survey drop in *Visualization* (11 % points) and *Measurements* (8 % points) indicating the need for more instruction in these areas.

Interdisciplinary Modeling Course

Background of the course

Funding for the four credit-hour graduate course GEOS 697 Interdisciplinary Modeling: Water Related Issues and Changing Climate, was provided by the Track 2 EPSCoR project. Dr. Laurel Saito was the Coordinating Instructor for this course, which was held at Boise State University for graduate students attending WC-WAVE-affiliated institutions. As outlined in the course syllabus, the Interdisciplinary Modeling Course introduces participants to models that are available in different disciplines. Students learn how such models might be applied together to address water-related issues regarding climate change, address issues of variability and uncertainty in implementing interdisciplinary approaches, and gain experience in working in interdisciplinary teams to apply interdisciplinary modeling approaches to increase knowledge about water-related issues regarding climate change. Students will:

- Discuss the philosophy of modeling
- Become aware of models in different disciplines used to address water issues related to climate change
- Work in interdisciplinary teams to explore issues and approaches associated with interdisciplinary modeling
- Complete an interdisciplinary modeling project that addresses one or more water-related issues related to climate change

Course Goals:

Goal 1: Increase awareness of models used in different disciplines to model water-related issues and climate change.

Goal 2: Increase knowledge of the challenges of applying models in an interdisciplinary context

Goal 3: Improve skills and confidence working in interdisciplinary teams to address complex issues

Goal 4: Increase confidence in doing interdisciplinary modeling

Goal 5: Increase enthusiasm for working with interdisciplinary modeling approaches for addressing water-related issues and climate change

Goal 6: Increase interest in interdisciplinary modeling

Background of the evaluation

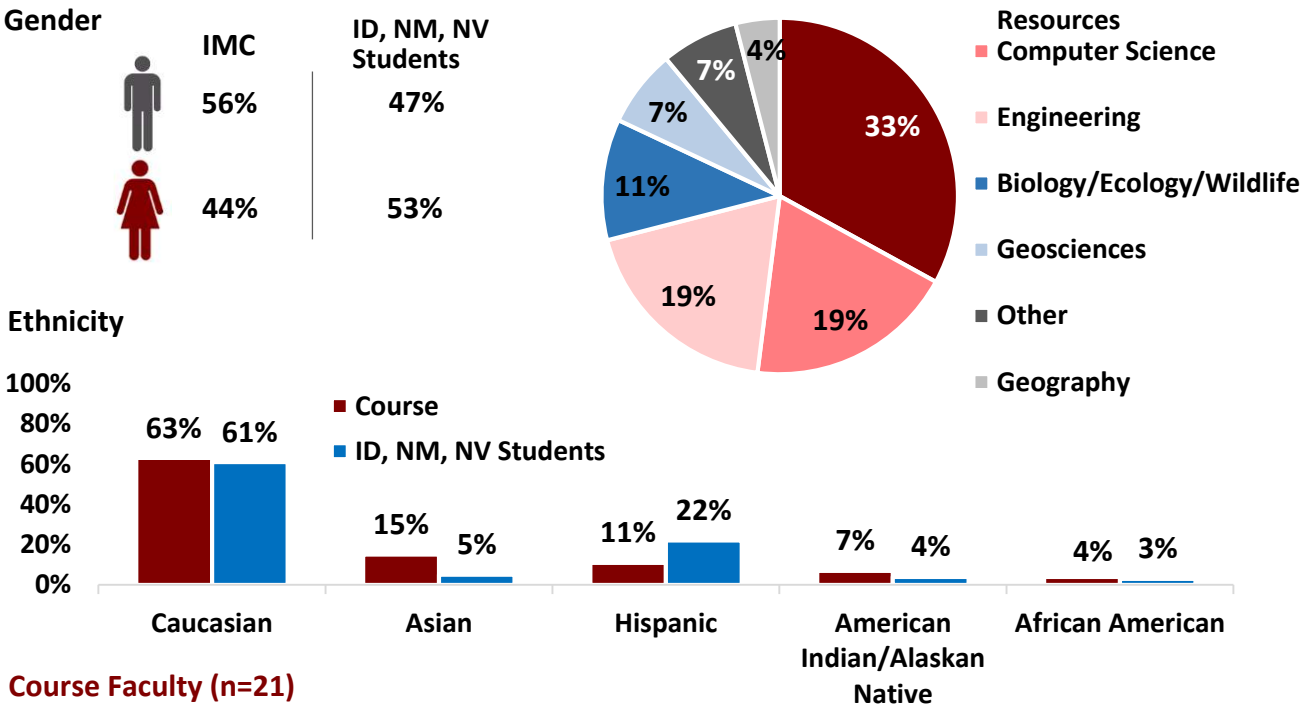
The full evaluation results of the course are included in this report, instead of a summary of findings, because survey results have not been reported previously. The evaluator developed three evaluation instruments to assess the quality of implementation and goal achievement: faculty course evaluation form, student pre-post survey, and daily course evaluation forms. The surveys were posted online and the coordinating course instructor was provided with direct links to the survey which she then provided to participants.

Demographics

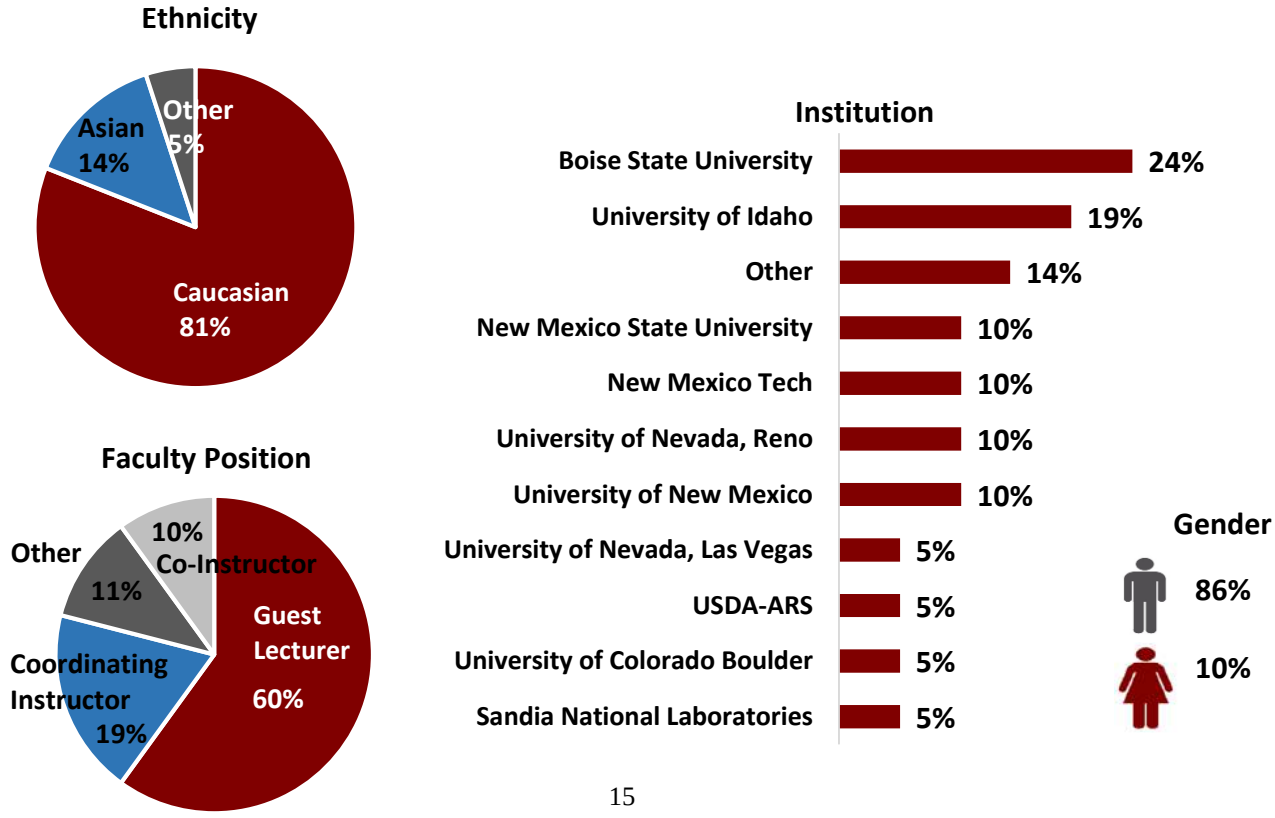
Course participants (n=28)

The evaluator notes the following differences between the participants and the comparison group comprised of Nevada, Idaho, and New Mexico students in higher education:

- American Indians and African American are well represented
- Women and Hispanics are underrepresented



Course Faculty (n=21)



Evaluation of course components

Course aspects

On the post-survey, course participants rated how much various aspects of the course helped their learning on a scale of 1-5, 1=*no help*, 5=*great help.* All aspects of the course were rated *much help* or *great help*.

Aspect of the course	Rating
Structure of the class	
The instructional approach taken in this class	3.96
How the class topics, activities, reading, and assignments fit together	3.96
The pace of the class	3.44
Class components	
Laboratory exercises	4.22
The case studies	4.15
Participating in class discussions	4.00
The lectures	3.67
Assignments and feedback	
Interdisciplinary modeling project	4.37
Feedback received on my work	3.67
Graded assignments	3.48
Class resources	
The virtual textbook	4.19
Online notes or presentations posted by instructor	4.19
Class binder of materials	3.74
Information given	
Pre-course information about course content (i.e.: schedule, syllabus, location)	4.30
Information about course assignments	4.11
Information about course expectations	4.11
Support for participants as an individual learner	
Interacting with the instructors during and outside of class	4.70
Working with peers as part of the class	4.70

Course format

Participants responded to questions about the course's format on the post-survey. The faculty strongly preferred the 2 week format and were open to using a hybrid teaching method while students slightly preferred the 3 week format and learning face-to-face. Most students felt including the computer science components was *very* or *extremely effective*.

	Faculty	Students
Duration		
13-day format is effective	95%	56%
Prefer course over 2 weeks	76%	48%
Prefer course over 3 weeks	24%	52%
Delivery method		
Course only face-to-face	57%	70%
Course partially online/partially face-to-face	43%	29%
Effectiveness of including computer science components	-	30% Very Effective 44% Extremely Effective

Activities

Participants' rated specific class activities on a scale of 1 to 5, 1=*no help* to 5=*great help*. The majority of class activities were rated as *much help*. Both the *hydrologic modeling lab* and the *Stella training session* were rated as a *great help.* The *Virtual SESs lab* was the lowest-rated activity as a *moderate help*.

IDM course activities	Rating
Hydrologic modeling lab (Saito)	4.37
Stella training session (Ahmad)	4.22
Conceptual modeling exercise (Saito/Ahmad/Link/Wilson/others)	4.19
Canopy interception/vegetation-atmosphere modeling lab (Link)	4.19
Groundwater modeling lab (Tyler)	4.15
Dry Creek Watershed field trip	4.11
Agent-based modeling lab (Pauli)	4.11
Remote sensing, land class evolution modeling lab (Cadol)	3.96
Weather and climate modeling lab (Flores)	3.96
Systems dynamics modeling lab (Tidwell)	3.74
Snow modeling/ecological modeling lab (Marks/Link/Hudiburg)	3.70
Virtual SESs lab (Lew)	3.30

Daily Evaluations

Participants rated daily course components on a Likert scale from 1=*extremely low* to 5=*extremely high* in the areas of presentation quality, knowledge gained, overall benefit, and effectiveness in increasing understanding. The ratings for each area were then averaged to create an overall picture of performance. Overall, ratings were very positive with overall averages near *very high*. Day 4 received the highest ratings while Day 11 received the lowest. There was no instruction on Day 2 due to the project's annual meeting.

	Day										
	1	3	4	5	6	7	8	9	10	11	Average
Quality of the presentation	3.86	4.18	4.14	4.11	4.09	3.99	3.99	4.09	3.50	3.33	3.93
Knowledge you gained about this topic	3.84	3.85	4.10	4.05	4.07	3.84	3.93	4.01	3.38	3.30	3.84
How beneficial is what you have learned?	3.91	3.90	4.15	3.95	3.86	3.85	3.83	3.80	3.21	3.11	3.76
Effectiveness in increasing your understanding	3.90	3.82	4.12	4.03	3.83	3.81	3.88	3.99	3.23	3.26	3.79

Logistics

Faculty and students rated logistical aspects of this class on a Likert scale of 1-5, 1=*poor*, 5=*excellent*. Participants rated most logistical aspects between *good* and *excellent*. Both faculty and students rated *food/lunches* the lowest (highlighted red) and *atmosphere* the highest (highlighted green). Overall, faculty rated most logistical areas slightly higher than students, with the exception of *accommodations* and *travel/transportation*. Four items (*registration process, lunches during class, other meals provided, hours*) were rated only by students while *food* was rated only by faculty.

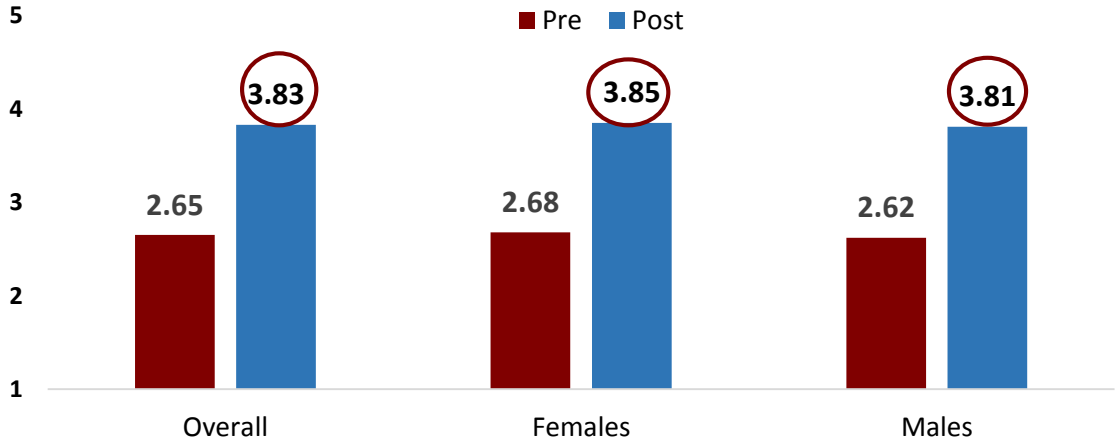
Logistical Items	Faculty	Students
Pre-course information	4.48	4.30
Accommodations	4.24	4.37
Course schedule	4.38	3.85
Course management	4.48	4.07
Classroom	4.43	4.37
Technology	4.57	4.04
Atmosphere	4.67	4.63
Travel/Transportation	4.33	4.41
Food	3.52	-
Registration Process	-	4.07
Lunches during class	-	3.30
Other meals provided	-	3.74

Achievement of course goals

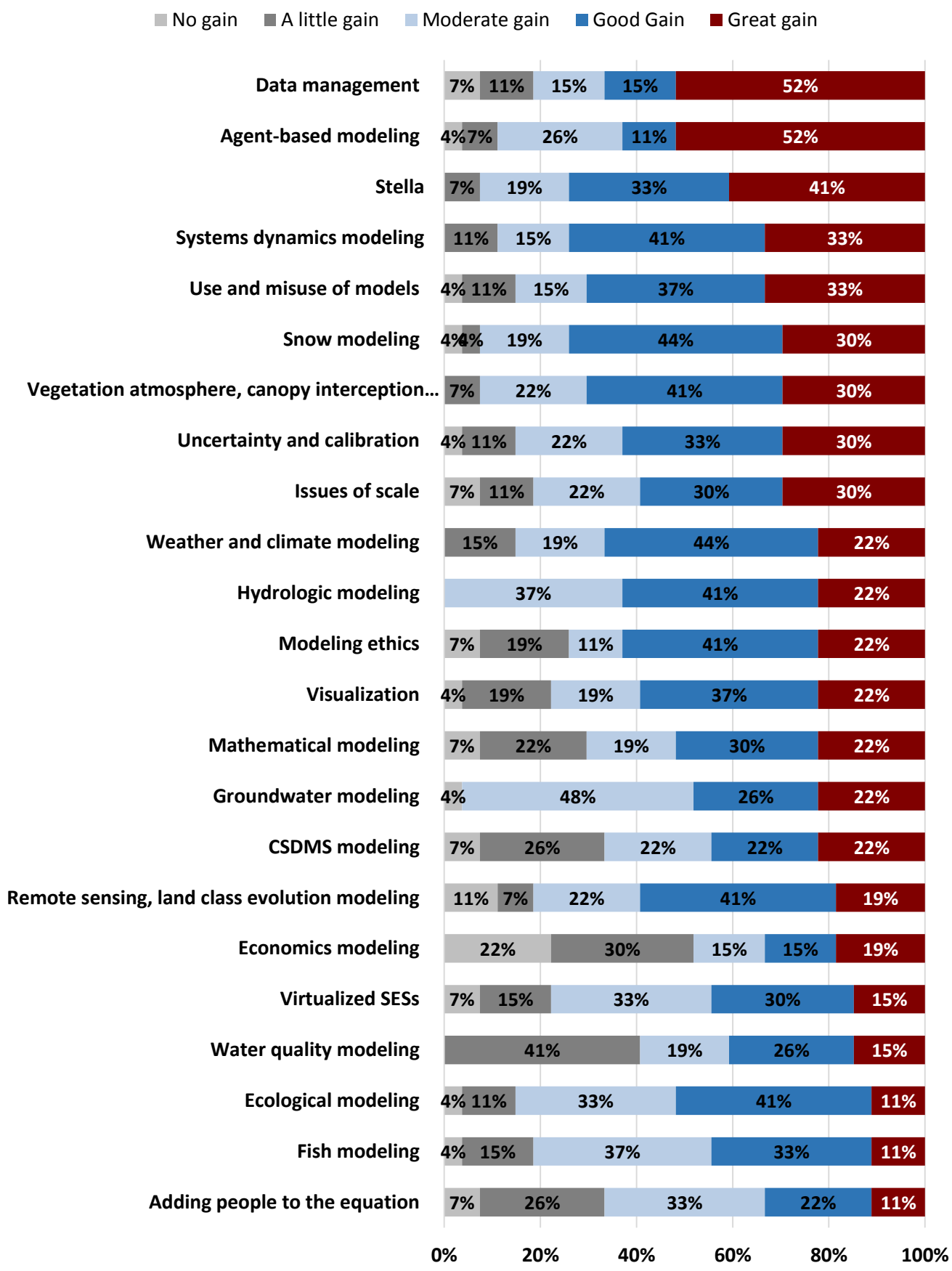
Each goal was analyzed individually to identify the impact of participation in this class. A p-value less than .05 is considered statistically significant and is denoted on the post bar with a red circle.

Goal 1 - Increase awareness of models used in different disciplines to model water-related issues and climate change

Participants completed pre- and post-survey questions to assess their perceived awareness of models used in different disciplines to model water-related issues and climate change. They rated their awareness on a Likert scale of 1-5, 1=*not at all*, 5=*a great deal* before and after participating in the class. Overall, participants demonstrated a significant gain in perceived awareness of models used in different disciplines to model water-related issues and climate change between the pre- and post-survey. Also, males scored slightly lower than females on the pre- and the post-survey.

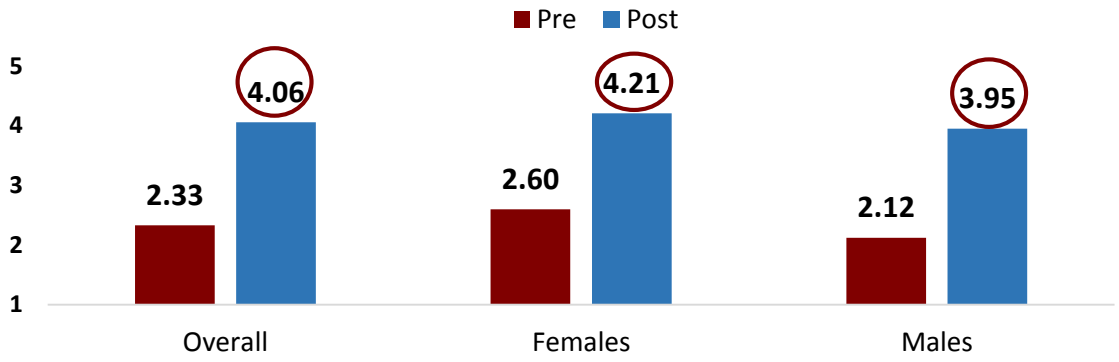


On the post-survey, participants rated knowledge and awareness they gained as a result of participating in this class. Statements were rated on a scale of 1-5, 1=*no gain*, 5=*great gain*. Between 34% and 74% of participants believe they experienced *good or great* gains in their awareness and knowledge. The highest gains were noted in *systems dynamic modeling, Stella, and snow modeling*. The smallest gains were noted in the areas of *adding people to the equation and economics modeling.*


No gain
A little gain
Moderate gain
Good Gain
Great gain
Data management 7% 11% 15% 15% 52%
Agent-based modeling 4% 7% 26% 11% 52%
Stella 7% 19% 33% 41%
Systems dynamics modeling 11% 15% 41% 33%
Use and misuse of models 4% 11% 15% 37% 33%
Snow modeling 4% 4% 19% 44% 30%
Vegetation atmosphere, canopy interception... 7% 22% 41% 30%
Uncertainty and calibration 4% 11% 22% 33% 30%
Issues of scale 7% 11% 22% 30% 30%
Weather and climate modeling 15% 19% 44% 22%
Hydrologic modeling 37% 41% 22%
Modeling ethics 7% 19% 11% 41% 22%
Visualization 4% 19% 19% 37% 22%
Mathematical modeling 7% 22% 19% 30% 22%
Groundwater modeling 4% 48% 26% 22%
CSDMS modeling 7% 26% 22% 22% 22%
Remote sensing, land class evolution modeling 11% 7% 22% 41% 19%
Economics modeling 22% 30% 15% 15% 19%
Virtualized SESs 7% 15% 33% 30% 15%
Water quality modeling 41% 19% 26% 15%
Ecological modeling 4% 11% 33% 41% 11%
Fish modeling 4% 15% 37% 33% 11%
Adding people to the equation 7% 26% 33% 22% 11%
0% 20% 40% 60% 80% 100%

Goal 2 - Increase knowledge of the challenges of applying models in an interdisciplinary context

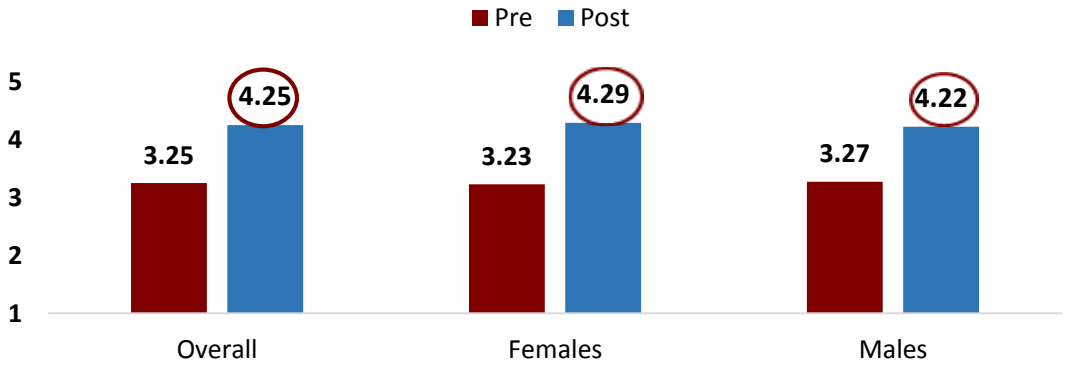
Participants completed pre- and post-survey questions to assess their perceived knowledge of the challenges of applying models in an interdisciplinary context. They rated their knowledge on a Likert scale of 1-5, 1= n*ot at all*, 5=*a great deal* before and after participating in this class. Overall, participants' knowledge of the challenges of applying models in an interdisciplinary context increased significantly. Again, males scored slightly lower than females on the pre- and the post-survey in their perceived knowledge.



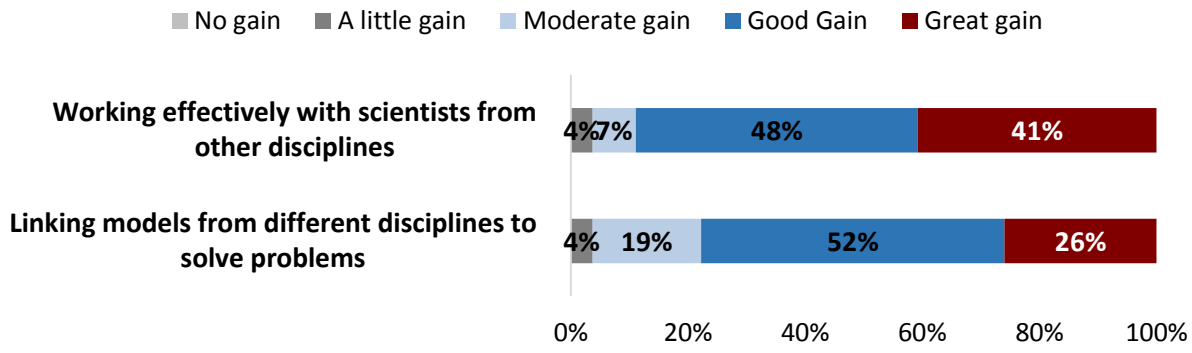
Goal 3 - Improve skills and confidence in working in interdisciplinary teams to address complex issues

Participants completed pre- and post-survey questions to assess their skills and confidence in working in interdisciplinary teams to address complex issues. They rated their skills and confidence on a Likert scale of 1-5, 1=*not at all*, 5=*a great deal* before and after participating in the class.

Overall, participants' skills and confidence in working in interdisciplinary teams to address complex issues increased significantly. Interestingly, males scored slightly higher than females on the pre-survey but lower on the post-survey for skills and confidence in working in Interdisciplinary teams.



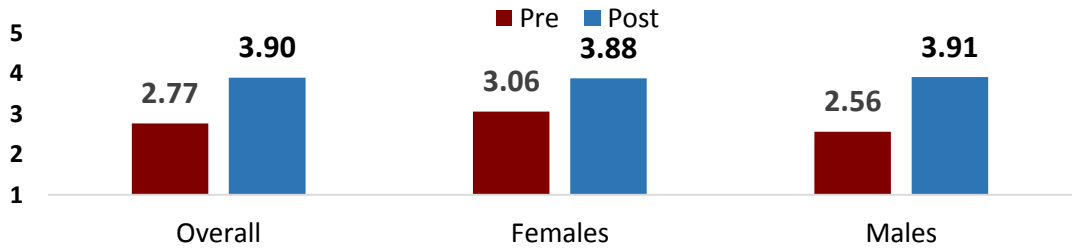
On the post-survey, participants rated their skills and confidence in working in interdisciplinary teams to address complex issues they gained as a result of participating in the class on a scale of 1-5, 1=*no gain*, 5=*great gain*. Between 78% to 89% of participants experienced *good* or *great* gains in this area.



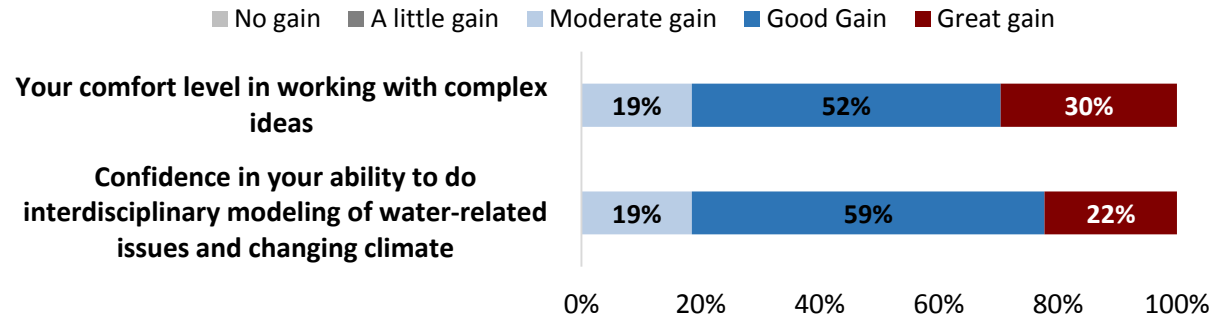
Goal 4 - Increase confidence in doing interdisciplinary modeling

Participants completed pre- and post-survey questions to assess their confidence in doing interdisciplinary modeling. They rated their skills on a Likert scale of 1-5, 1=*not at all*, 5=*a great deal* before and after participating in the class.

Overall, participants' confidence in doing interdisciplinary modeling increased significantly overall and for both genders. While males began with lower pre-survey ratings, they had higher ratings than females on the post-survey.



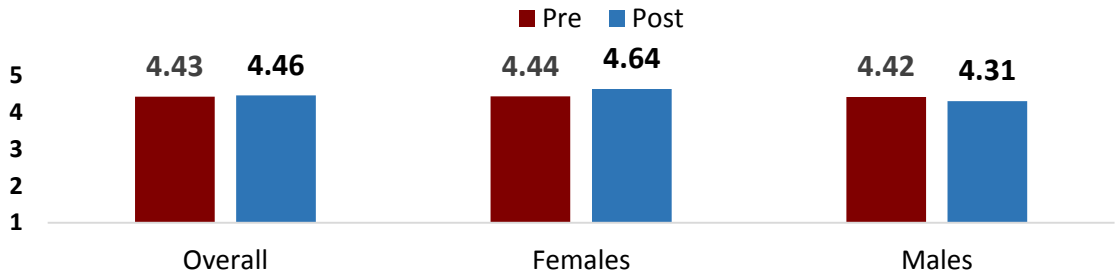
On the post-survey, participants rated confidence they gained in doing interdisciplinary modeling as a result of participating in the class. Statements were rated on a scale of 1-5, 1=*no gain*, 5=*great gain*. Over 81% of participants indicated they experienced *good* to *great* gains in this area.



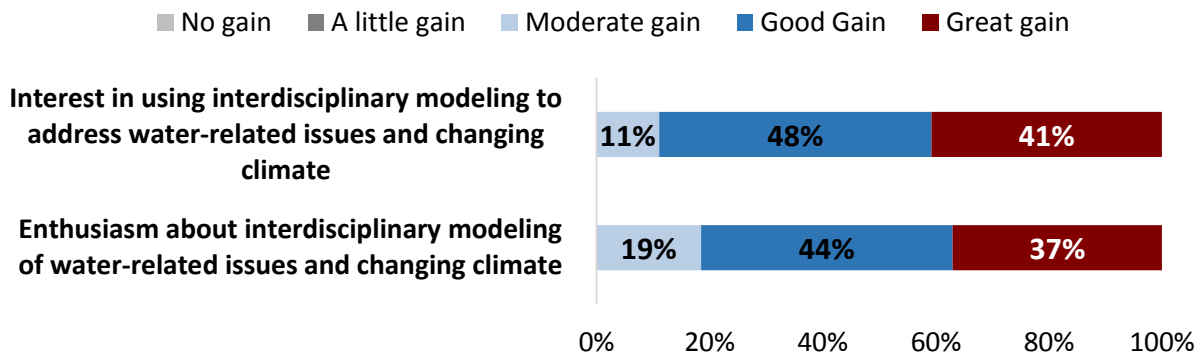
Goal 5 - Increase enthusiasm for working with interdisciplinary modeling approaches for addressing water-related issues and climate change

Participants completed pre- and post-survey questions to assess their enthusiasm for working with interdisciplinary modeling approaches for addressing water-related issues and climate change. Participants rated their skills on a Likert scale of 1-5, 1=*not at all*, 5=*a great deal* before and after participating in the class.

Overall, participants' enthusiasm for working with interdisciplinary modeling approaches did not increase significantly nor did males or females separately exhibit a significant increase from pre- to post-surveys. However, females showed a pre- to post-increase while males showed a decline in interest.



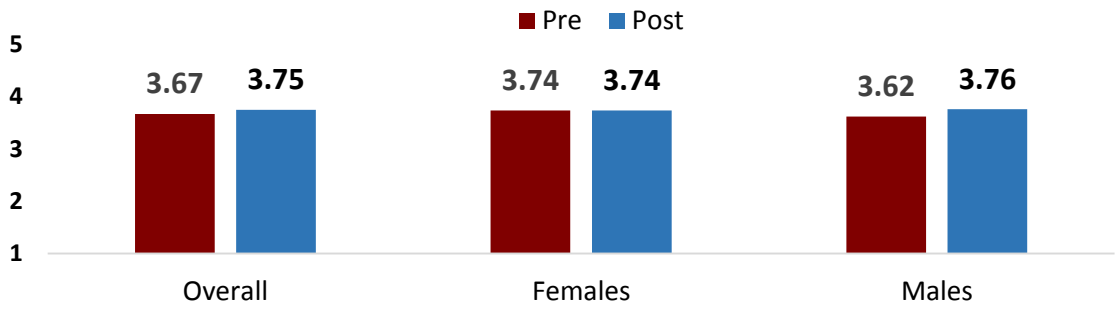
On the post-survey, participants rated enthusiasm they gained for working with interdisciplinary modeling approaches for addressing water-related issues and climate change as a result of participating in the class on a scale of 1-5, 1=*no gain*, 5=*great gain*. Between 81% and 89% of participants they experienced *good* or *great* gains in this area.



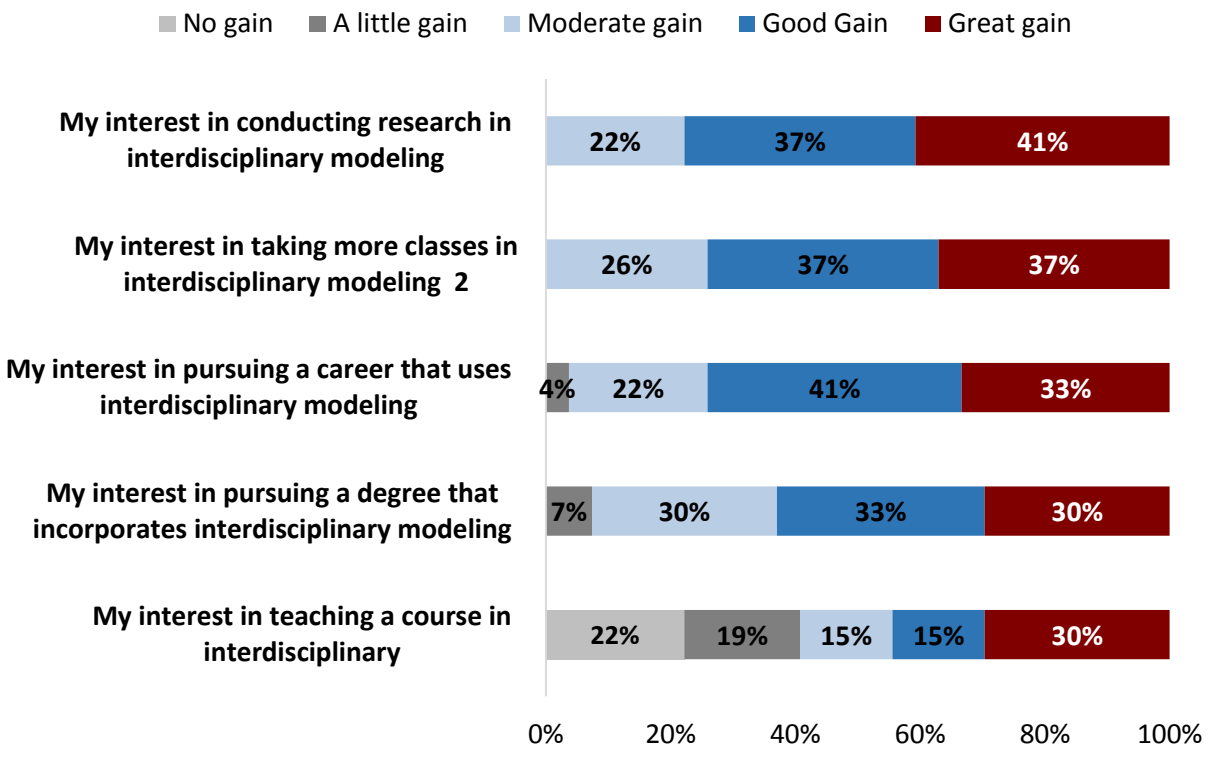
Goal 6 - Increase interest in interdisciplinary modeling

Participants completed pre- and post-survey questions to assess their interest in doing interdisciplinary modeling. They rated their skills on a Likert scale of 1-5, 1=*not at all*, 5=*a great deal* before and after participating in the class.

Overall, participants' interest in doing interdisciplinary modeling did not increase significantly overall or for either gender. Females showed no pre- to post-survey change.

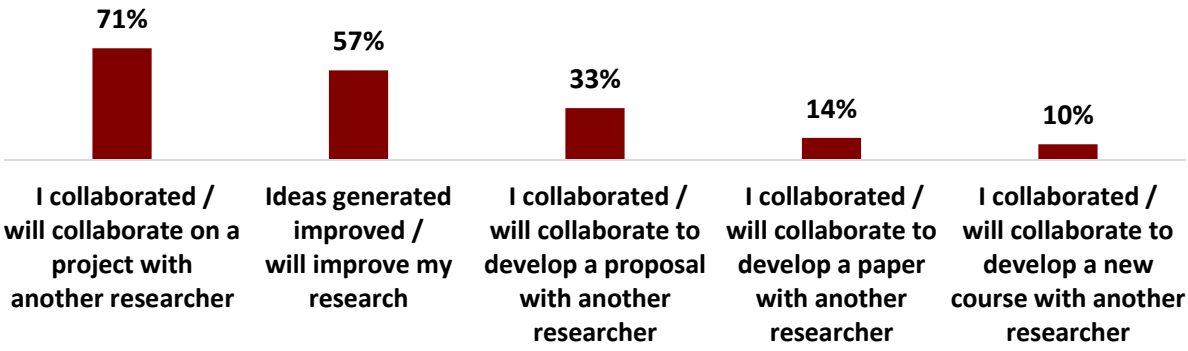


On the post-survey, participants rated interest they gained in doing interdisciplinary modeling as a result of participating in the class on a scale of 1-5, 1=*no gain*, 5=*great gain*. Between 45% and 78% of participants indicated that they experienced *good* or *great* gains in this area.



Faculty impacts of participation in course

All twenty-one faculty indicated whether participation in the course led to the strengthening of existing and the development of new collaborations. Nineteen indicated participation strengthened existing relationships. Of those, twelve indicated one collaboration was strengthened, and seven indicated two or more collaborations were strengthened. When asked if participation in this course improved their research or increased collaborations, twelve faculty reported they have generated ideas that have or will improve their research. Fifteen collaborated or plan to collaborate with other researchers on a project, seven on a proposal, and three on a paper. Two faculty collaborated or plan to collaborate on developing a new course with another researcher.



Key Findings

- Women and Hispanics were underrepresented based on the comparison group. American Indians and African Americans were well represented.
- All course aspects were rated *much help* or *great help*.
- Faculty strongly preferred the 2 week course format while students slightly preferred the 3 week format.
- Most class activities were rated as *much help*.
- Most participants rated the logistics as *good* or *excellent*.
- There were statistically significant gains for:
  Goal 1: Increase awareness of models used in different disciplines to model water-related issues and climate change.
  Goal 2: Increase knowledge of the challenges of applying models in an interdisciplinary context
  Goal 3: Improve skills and confidence working in interdisciplinary teams to address complex issues
  Goal 4: Increase confidence in doing interdisciplinary modeling

  But not for:
  Goal 5: Increase enthusiasm for working with interdisciplinary modeling approaches for addressing water-related issues and climate change
  Goal 6: Increase interest in interdisciplinary modeling

Key Findings and Recommendations

Demographics – The demographics for the various meetings and activities were assessed differently based on comparison groups. In broadly assessing the various activity participant demographics, the programs targeting undergraduates and graduate students demonstrated noteworthy representation of American Indians and African Americans, while Hispanics were underrepresented. In terms of gender, the activities assessed this quarter showed women as well represented.

Effectiveness of program implementation – Activities were generally assessed positively by participants, the majority of whom rated these as "extremely/very useful." There was some critical feedback regarding logistics, which included providing healthier choices during meals and notifying participants of all the activities on the agenda prior to the meeting/workshop. However, across all activities, participants rated logistics and activities highly. They provided positive comments regarding their experiences. However, for UVMN, the pre to post results only increased four percentage points

Achievement of program objectives and impact on participants – Participants across all activities evaluated this quarter demonstrated significant gains in knowledge. All program objectives were met. Meeting and workshop participants reported that their knowledge, skills, and future academic and professional plans were all positively impacted.

Overall – The project, as a whole, is moving forward, with timely implementation and conduct of activities. The Workforce Development components in collaboration with project science faculty successfully conducted another year of UVMN. Based on the Summer Meeting evaluation, project participants are integrated in watershed groups and are achieving their research goals.

Recommendations

- Focus on recruiting Hispanic participants.
- Track students' progress from one level of education to the next if they remain active in WC WAVE activities.
- Document the activities (such as meetings and research progress) of the watershed – based research groups. Share these with the group as a whole.
- Add opportunities throughout the year for UVMN participants to implement what they learn in their summer workshops.

Upcoming Evaluation Activities

Innovation Working Group
October meeting
Watershed field experience
New participant baseline survey

SMARTSTART
EVALUATION AND RESEARCH

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