

## The project impact on groups:

### Student Impact:

*Supporting evidence:* Below is the data that addresses/supports the impact statements made above. The tables below are a part of the GraSUS External Evaluator Year-3 Formative Report. It is based on the survey results (conducted in the last 3 years and relevant passages from teacher/fellow interviews during evaluator's visits to the campus).

Survey Item	Year	Proportion of students who:		
		<i>Somewhat or Definitely Agree</i>	<i>Somewhat or Definitely Disagree</i>	<i>Stated they had no Opportunity to Observe</i>
The NDSU student helps us solve problems and do our work.	04-05	.90	.09	.01
	05-06	.93	.05	.02
	06-07	.93	.06	.01
I have learned some things about science or math from the NDSU student.	04-05	.85	.14	.01
	05-06	.95	.05	.01
	06-07	.89	.10	.01
I like the activities that the NDSU student does with us.	04-05	.83	.17	.00
	05-06	.89	.10	.01
	06-07	.88	.10	.02

**Table 1.** Grades 6-12 students' responses to end-of-year survey about the fellows' impact on their learning.

Survey Item	Year	Proportion of students who:		
		<i>Somewhat or Definitely Agree</i>	<i>Somewhat or Definitely Disagree</i>	<i>Stated they had no Opportunity to Observe</i>
The kids in our class ask the fellow questions about NDSU.	04-05	.66	.28	.06
	05-06	.78	.18	.04
	06-07	.60	.35	.05
The NDSU student seems to like working with us.	04-05	.91	.08	.01
	05-06	.96	.03	.01
	06-07	.95	.04	.01
The kids in our class ask the NDSU fellow questions about math or science.	04-05	.87	.11	.02
	05-06	.91	.08	.01
	06-07	.92	.07	.01
The NDSU student is good at explaining things.	04-05	.81	.18	.01
	05-06	.86	.13	.01
	06-07	.87	.12	.01

**Table 2.** Grades 6-12 students' responses to end-of-year survey items about the GraSUS

Survey Item	Year	Proportion of teachers who:		
		<i>Agree or Strongly Agree</i>	<i>Disagree or Strongly Disagree</i>	<i>Stated they had no Opportunity to Observe</i>
My students are enthusiastic about the lessons/activities developed by my fellow.	04-05	.88	.13	.00
	05-06	1.00	.00	.00
	06-07	1.00	.00	.00
My students are not interested in my fellow or his/her studies at NDSU.	04-05	.13	.88	.00
	05-06	.14	.86	.00
	06-07	.00	1.00	.00
The activities developed by	04-05	.94	.06	.00

my fellow are helping to increase my students' abilities to solve problems.	05-06	1.00	.00	.00
	06-07	1.00	.00	.00

**Table 3.** Teachers' responses to end-of-year survey items about fellows' impact on student learning.

*Anecdotal evidence:* Below is some anecdotal evidence for the project impact on students, all comments are taken from answers by students to open ended questions in the student surveys.

"We did an activity on water clarity. It was fun because we got to see what engineers do right here in our area."

"The NDSU student traveled to Antarctica and studied rocks. He talked with us over satellite phone and taught us a lot."

"Luminol can be used in criminal investigations. It was a very interesting activity that made me think of a possible career in the criminal investigation field."

"I liked the Jeopardy game because it made me rethink of all the things that I had done and it made me feel more involved."

"In Jeopardy, we learned how to solve problems that maybe we didn't know how to do."

"The Jeopardy Review was really fun. We liked to try to find errors where James actually had a wrong answer. He would challenge us to try to find errors, and when we did, he'd tell us we were that much more prepared for the test!"

"Jeopardy review was challenging. The questions weren't written the same way as what we practiced in the book, so we really had to know what we were doing and had to understand the problems. I liked that because it showed that I really learned and understood the material."

"I really liked the factoring review card game. It finally made sense to me how to factor when I was able to see the answers and the questions and then just had to match them up. I also like that we could win a free homework pass for getting them all right."

"I really liked all the card games because it gave us the opportunity to win homework and quiz passes, and we got to compete against other partners. Plus, you really have to think to get all the problems right."

"I liked the M&M and Spaghetti activity. It taught me how to work with data and to use the special features of my calculator efficiently."

"I liked the Human Venn Diagram activity. [Fellow] gave the whole class clue cards and we had to figure out where to stand in the Venn Diagram. We really had to work together as a class to figure it out."

"I didn't understand standard deviation at all until we did the Paper Airplane activity. Then it made total sense because only a certain percentage of planes could pass flight inspections based on standard deviation and the normal curve."

"[Fellow] is a great tutor. He is available throughout the day and is always willing to help. He and Mrs. [Teacher] worked really well together to help all of us learn both in and out of class."

“The Trig Identity Videos were awesome! Each group had to get the class to learn an identity by doing a skit that was on a card. We were tour guides and had to explain our identity to the class as though we were guiding a tour. Some of the videos were hilarious!”

“Sometimes, you get more involved with hands-on experiments to help understand.”

“I think some people think it’s easier to ask questions to the NDSU student than the teacher.”

“We have another person to ask questions about our assignments to.”

“Mrs. [Teacher] and [Fellow] are a really good team. They work together and both know how to get the point across to us in their own ways. While Mrs. [Teacher] is teaching, [Fellow] is walking around helping us if we need it. If [Fellow] is teaching, Mrs. [Teacher] is walking around making sure we understand. I like that there are 2 people because then I get the help I need.”

“I liked when Mrs. [Teacher] would be teaching something and [Fellow] would talk about how what we are learning relates to what he does as an engineer. He would tell us why it was important to learn our math and that we would need it later on. Sometimes he would use engineering in his activities to help us understand what we were learning.”

## II. Teacher Impact:

*Supporting evidence:* Below is the data that addresses/supports the impact statements made above. The tables below are a part of the GraSUS External Evaluator Year-3 Formative Report. It is based on the survey results (conducted in the last 3 years and relevant passages from teacher/fellow interviews during evaluator’s visits to the campus).

Survey Item	Year	Proportion of teachers who:		
		<i>Agree or Strongly Agree</i>	<i>Disagree or Strongly Disagree</i>	<i>Stated they had no Opportunity to Observe</i>
Our work in the August Summer Academy had no relation to state or National SM educ. Standards.	04-05	.06	.88	.06
	05-06	.07	.71	.21
	06-07	.00	1.00	.00
My own understanding of science, math, or tech. is expanding as a result of working with my fellow.	04-05	1.00	.00	.00
	05-06	.79	.14	.07
	06-07	1.00	.00	.00
Our monthly GraSUS seminars are important learning experiences for me.	04-05	.94	.06	.00
	05-06	1.00	.00	.00
	06-07	1.00	.00	.00

**Table 4.** Teachers’ responses to end-of-year survey items about their own professional development.

Survey Item	Year	Proportion of fellows who:		
		<i>Agree or Strongly Agree</i>	<i>Disagree or Strongly Disagree</i>	<i>Stated they had no Opportunity to Observe</i>
I believe that my teacher has an opportunity to learn more sci., math, or tech. as a result of my work with him/her.	04-05	.92	.08	.00
	05-06	.91	.09	.00
	06-07	.91	.09	.00
My teacher does not utilize my	04-05	.00	1.00	.00

talents very well.	05-06	.27	.73	.00
	06-07	.00	1.00	.00
My teacher values my work with him/her.	04-05	.92	.08	.00
	05-06	1.00	.00	.00
	06-07	1.00	.00	.00
I believe that the Summer Academy was a successful use of our time.	04-05	.75	.08	.17
	05-06	.91	.09	.00
	06-07	.73	.18	.09
The Summer Academy resulted in some valuable planning time between me and my teacher.	04-05	.58	.25	.17
	05-06	.82	.09	.09
	06-07	.45	.45	.09

**Table 5.** GraSUS-II fellows' responses to end-of-year survey items about their teachers' professional development.

Survey Item	Year	Proportion of teachers who:		
		Agree or Strongly Agree	Disagree or Strongly Disagree	Stated they had no Opportunity to Observe
The university faculty member on our team is not very involved with our GraSUS work.	2004-05	.25	.75	.00
	2005-06	.07	.71	.21
	2006-07	.08	.92	.00

**Table 6.** Teachers' responses to end-of-year survey items on faculty involvement with GraSUS-II.

*Anecdotal evidence:* Below is some anecdotal evidence for the project impact on teachers, all comments are taken from teacher/fellow reports and from answers to open ended questions in the teacher/fellow surveys.

"I appreciated the November meeting with math small group. [Lead teacher] showed a funny Ma and Pa Kettle math lesson that is perfect for a situation that arose in my class on Thursday. I hope to fit it in sometime this week. It was neat to see what the other GraSUS students have been doing and to actually work through a lesson (been a long time since I've thought about radians!). I enjoy seeing other people's classrooms, too. [Lead teacher] addressed an idea that I've been struggling with in regards to pre- and post-testing: how do we capture the impact of GraSUS vs. having it all mixed in with the other lesson work that we do with students. I really like her idea of doing very specific, short (as in, 5 minutes -- time is always a factor for me) pretest right before and then a follow up right after a GraSUS lesson. That seems so much more doable and relevant to me."

"Another project that [Fellow] developed for my Algebra I students dealt with the writing of linear equations and extrapolation. This project, the "Spaghetti Project", had the students look for a relationship between the length of the spaghetti to the amount of weight that it could hold. Once the relationship was made, the students were asked to extrapolate. They did very well following [Fellow]'s instructions and all arrived at similar responses, which was evidence of success. This project is another one that I will use again, in the future."

"My department (pharmaceutical sciences) was getting rid of a bunch of glassware. I found some flasks, beakers, funnels, graduated cylinders, and test tubes that will be donated to WFHS. There are more than enough test tubes to go around. Please let the other GraSUS science teachers know that I have them. I will bring them to the meeting on Tuesday Sept 14. Also, my advisor Dr. Chatterjee is willing to donate a PCR thermocycler to the WFHS and we are working on getting that to go through."

"I did have [Fellow] research graphing calculators for me. Our school is purchasing classroom sets of graphing calculators and researched the advantages of the TI-84+ over the TI-83+. She also found a list

of the teacher bonuses for the proofs of purchases and researched our options. Finally she double checked that the overhead display panels that we currently have would function properly with the new calculators that we are purchasing. This was an unexpected request from me and she took care of it in an efficient manner without much guidance from me. Our whole math department / principal thank her.”

“My fellow has brought real-life experiences and labs into the classroom. Students have been able to apply what has been learned in a real example.”

“[My fellow is helpful in] Assisting with the district goals of unwrapping standards and supplementing the lessons.”

“My GraSUS student developed some great activities for my classes – things I never would have had the time to do myself. My fellow provided a positive role model for my students, creating interest and enthusiasm for science.”

“[Fellow] was able to bring in speakers and lessons that were educationally beneficial to the students. These activities enhanced the curriculum and provided a greater opportunity for the students to learn. The fellow was an excellent resource for both the students and myself.”

“Counting this year, I have worked with 3 GraSUS fellows. They have all been helpful to me in their own ways, but this year’s fellow was in a separate class. He helped improve all aspects of my physics classes. He developed curriculum that will stand the test of time and be used in the future. He assisted students in their learning through individual tutorials, small group work and presentations to the entire class. He manufactured apparatuses which I can use for future demonstrations and labs. He acted as a sounding board to help me plan new activities and he provided useful constructive criticism. I will definitely miss working with him next year.”

“I think this is an outstanding program with a wonderful future. I just wish more teachers were able to utilize this great resource.”

“Overall I am very pleased to have participated in this year’s GraSUS project and I have no major suggestions for improvement. My participation has improved the teaching and learning in my classroom, provided me with dialogue opportunities with other professionals, and allowed travel experiences which I will remember fondly. Sincere thanks to all involved with this program.”

### III. Fellow Impact:

*Supporting evidence:* Below is the data that addresses/supports the impact statements made above. The tables below are a part of the GraSUS External Evaluator Year-3 Formative Report. It is based on the survey results (conducted in the last 3 years and relevant passages from teacher/fellow interviews during evaluator’s visits to the campus).

Survey Item	Year	Proportion of teachers who:		
		<i>Agree or Strongly Agree</i>	<i>Disagree or Strongly Disagree</i>	<i>Stated they had no Opportunity to Observe</i>
My fellow is comfortable working with my students.	04-05	1.00	.00	.00
	05-06	.93	.07	.00
	06-07	1.00	.00	.00
My fellow demonstrates	04-05	.94	.06	.00

interest in helping students learn science or math.	05-06	.93	.07	.00
	06-07	1.00	.00	.00

**Table 7.** Teachers' responses to end-of-year survey items about their fellows' skills.

Survey Item	Year	Proportion of fellows who:		
		Agree or Strongly Agree	Disagree or Strongly Disagree	Stated they had no Opportunity to Observe
A big part of my fellowship work involves developing lessons or activities.	04-05	.92	.08	.00
	05-06	.91	.09	.00
	2006-07	.91	.09	.00
I am learning a great deal about teaching.	04-05	1.00	.00	.00
	05-06	1.00	.00	.00
	06-07	1.00	.00	.00
I am learning a great deal about student learning in science or mathematics.	04-05	1.00	.00	.00
	05-06	1.00	.00	.00
	06-07	1.00	.00	.00
I feel that my ability to communicate with students is improving through my work in GraSUS.	04-05	.92	.08	.00
	05-06	1.00	.00	.00
	06-07	1.00	.00	.00

**Table 8.** GraSUS-II fellows' responses to end-of-year survey items about their work with the project and its effects on them.

<i>Fellows' Self-Reports on the Nature of their Classroom Work (n=11)</i>	
Revision/creation of labs and learning activities	11
Interacting with or assisting students	11
Preparing materials for the day's activities	11
Introducing or teaching activities or portions of lessons	11
Observing lessons taught by the classroom teacher	7
Grading of student work, particularly the projects they developed	5

**Table 9.** Fellows reporting of their classroom work during focus group Sessions, May 2007.

*Anecdotal evidence:* Below is some anecdotal evidence for the project impact on fellows, all comments are taken from teacher/fellow reports and from answers to open ended questions in the teacher/fellow surveys.

“It's been a very enjoyable experience and I feel like I've grown in many areas. My communication skills have been strengthened, my excitement for science has increased, and I have learned many new things about biology. I discovered a passion for teaching that I didn't realize was in me and an increased concern for young people. I was also stretched in areas of creativity, organization and efficiency. I think the GraSUS program is awesome and hope to see it continue to touch lives of many students and teachers.”

“I have enjoyed my time at MHS and feel like a part of the class. This was really important to me because I really like teaching my own class. [Teacher] has done a great job at including me.”

“I also worked on a trig identities presentation project for the students. We wanted to do something with the trig identities so that the students would have to say them and hear them a number of times. Each team was given a theme and a trig identity and was asked to come up with a short presentation. We wanted to

make it fun since the repetition of the identity was the focus. Some of the themes were: You are the new hosts of Blue's Clues, You are CSI's trying to solve a mystery, you are a Fargo tour guide, etc. I also wrote up a rubric for these presentations. This was a lot harder than I expected. Since this was the first time either [Teacher] or I tried this, we didn't know what to expect from the students. We decided to have the students grade each other ([Teacher] graded as well). I find it a bit frustrating when the students announce: give me a 4 and I'll give you a 4. However, I shouldn't be too surprised; I probably would have done the same thing when I was in high school. Many times throughout this year, I'm finding that my perspective is much different when my role is "teacher" than it was when I was the student."

Below are the anecdotes from past GraSUS fellows (excerpted from a survey on the long term impact of the program on fellows):

"GraSUS has had, and continues to have, a tremendous positive impact on my professional development. I have been able to work with wonderful secondary teachers, college professors, and fellow students, from whom I have learned a tremendous amount about teaching science. I have maintained contact with many teachers, professors, and students from GraSUS; we continue to share exciting ideas about teaching science. In addition, I routinely check the NDSU GraSUS website for new ideas. For me, GraSUS represents a striving for excellence in science education and I will continue to work to improve my teaching throughout my career. I will do this using the skills I developed in GraSUS, but more importantly by collaborating with colleges, both old and new."

"First of all, it made me realize how much I love working with students and continually learning with the students and fellow teacher. It was an incredible experience and gave me insight in the classroom that I had not been exposed to in the past. From this experience, I decided to obtain my secondary ed teaching license. I also was able to be creative, find new teaching methods, materials, and activities that would prepare high school students for college. When I had taught intro level freshman lab courses as a TA, many students were ill prepared for their introductory science courses and I felt it was necessary to prepare them for their future in various ways. I feel that this experience put me at a level not many other entry-level teachers are at and gave me a springboard for my career as an educator."

"GraSUS has given me tremendous insight into planning lessons and laboratories and then implementing them. It has allowed me to confront the question, "what is the objective of this lesson?!" which I did not always consider before. I think I will be able to scale up many of the lab activities for use at the Fresh/sophomore college levels. I have developed a deeper appreciation for constraints and challenges of the high school teacher, as well as, for their requirement to follow state and national science standards. I have learned a lot from cooperating teachers about managing a classroom, encouraging discussion from otherwise quiet students, and developing assessment tools. I had no idea what a rubric was until working in a high school science classroom. I love teaching and have learned a lot from some excellent teachers in the public school system."

"I think the biggest positive impact GraSUS has had on my professional development is teaching experience. I enjoyed my time teaching to students and thinking of new ways to stimulate the students. Junior High students are not known for long attention spans so time was spent on lesson plans and projects that hopefully they could retain. I hope to teach at the University level some day so any experience teaching is positive."

"GraSUS has greatly shaped the way I view education and the way I teach. It does not happen often that so many talented people in all aspects of education come together."

“GraSUS had a profound impact on my professional development. Because of GraSUS, I decided to pursue a career in the education field. If it wasn't for the wonderful, positive experiences I had in GraSUS, the great people I met, and the relationships I developed with the other people and teachers in the program, I probably wouldn't have decided to become a teacher. In addition, it gave me a good base of experiences and knowledge to continue on with my education courses. I learned a lot from my cooperating teacher and from all the other GraSUS participants, and I am able to use that in my course work and personal development as a future teacher.”

“During most of my undergraduate time at NDSU my main focus was on practical engineering problems. Working in GraSUS gave me a different view outside of the narrow engineering problems I looked at. I got a look at how the graduate and high school educational (teaching) worlds work. I think meeting graduate students and meeting teachers in a setting different than the teacher-student relationship has been a positive experience that gave me motivation to enter graduate school now.”

“It gave me the ability to work with many of my peers on “Cool Science Stuff” that I would not have the opportunity to do normally. I was able to take classes and work shops on instructional strategies, judge the state science fair, go to the state science convention and network with other faculty and science teachers to gain more resources and insight to education.”

“GraSUS was an immense aid to my professional development and eventual hire by Florence Unified School District. Before I began my teaching career or student teaching I was being exposed to the classroom environment. The program allowed me to become more comfortable in front of the classroom and it provided me with a unique opportunity to interact with the students in a way teachers are able to.”

## Other Longitudinal data relevant to GraSUS impact:

Teacher distribution across participating school districts:

School District	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008	Total
Fargo	7	14	4	13	8	10	8	64
W. Fargo	5	5	2	4	8	13	6	43
Moorhead	4	6	1	3	2	2	2	20
Kindred	1	--	--	--	1	1	1	3
C. Cass	1	1	--	1	--	--	--	3
N. Cass	1	1	--	--	--	--	--	2
Enderlin	2	2	--	--	--	--	--	4
<b>Total</b>	21	29	7	21	19	26	17	139

Fellow distribution across NDSU colleges:

College	01-02 Gr/UGr	02-03 Gr/UGr	03-04 Gr/UGr	04-05 Gr/UGr	05-06 Gr/UGr	06-07 Gr/UGr	07-08 Gr/UGr	Total Gr/UGr
Agr.	1/2	2/1	0	1/0	1/0	1/1	0	6/4
E&A	2/2	0/1	0	1/4	3/3	0/2	2/4	8/16
Pharm.	0	0	0	1/0	1/0	0	0/1	2/1
S&M	6/5	9/7	1/5	4/3	2/4	4/3	3/2	29/29
<b>Total fellows</b>	8/9	11/9	1/5	7/7	7/7	5/6	5/7	44/50

Teachers receiving graduate credit:

Teachers receiving grad credit	01-02	02-03	03-04	04-05	05-06	06-07	07-08	Total
	23	31	0	12	11	N/A	7	84

NDSU faculty participating in GraSUS activities:

Faculty involved in activities	01-02	02-03	03-04	04-05	05-06	06-07	07-08	Total
	19	41	12	41	39	32	40	220

Classroom/lab projects (units/artifacts) developed by GraSUS teams:

	01-02	02-03	03-04	04-05	05-06	06-07	07-08	Total
Projects	28	78	61	75	60	100+	100+	500+