REFLECTIONS

GraSUS Newsletter • Winter 2006-07

NDSU GraSUS - II

(**Gra**duate **S**tudent-**U**niversity-**S**chool Collaborative for Science, Mathematics, Engineering and Technology)

Mission

The mission of the NDSU GraSUS-II program is to enhance science and mathematics education in grades 6-12 through the direct involvement of graduate and advanced undergraduate students in SMET (science, mathematics, engineering, technology) disciplines.

The program also provides support and enhanced professional development of science and mathematics teachers.

Inside this edition . . .

Upcoming Events

- Annual Meeting for GK-12 Project Teams: March 9-11, 2007, Washington, D.C.
- 2007 NDSTA Conference: March 23-24, Minot, N.D.
- 2007 NSTA National Conference: March 29-April 1, St. Louis, Mo.
- 2007 NDCTM Conference: March 30-31, Fargo, N.D.
- 2007 AERA Annual Meeting and Exhibition: April 9-13, Chicago, IL
- 2007 AAAS-SWARM Conference: April 18-21, Houston, Tex.
- GraSUS Spring Celebration: May 3rd

Dates to Remember

- February 19 ..... President's Day
- March 12-16 ..... DSU Spring Break
- April 6-9 ..... NDSU Spring Holiday
- May 7-11 ..... NDSU Finals Week
- May 2-4 ..... NSF External Evaluator Visit

GraSUS-II is supported by the GK-12 program of the National Science Foundation (Project #DGE-0338128) and by North Dakota State University and The Center for Science and Mathematics Education.

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Everyone a Teacher, Everyone a Learner, Everyone a Leader

Ed Deckard is a faculty representative of the GraSUS Leadership Group. He is a Professor in the Department of Plant Sciences at North Dakota State University.

The NDSU GraSUS program is an excellent collaboration that results in the growth of individuals, extending far beyond the participation boundaries of the program. Although direct evidences have been and continue to be collected that supports the previous statement, I am also convinced by my participation and my discussions with program participants. In addition, I am convinced that my involvement in GraSUS (including summer academies, monthly seminars, K-12 classroom visits, planned meetings, conversations, and poster sessions) has provided me the opportunity to grow more than other participants. However, it would not surprise me to hear many others are convinced of the same. Isn't that what we strive for, whether in a single classroom or a network of many educational entities, the feeling by many that "I have learned the most?" Many have said that your greatest learning occurs when you teach others. I believe that is true, especially when you assess the effectiveness of your teaching. GraSUS calls on everyone to teach, from university and K-12 teachers to undergraduate and graduate students, to K-12 students; and GraSUS emphasizes the assessment of all activities. GraSUS develops teachers and learners.

GraSUS also develops leaders. Regardless of your "position" in GraSUS, you "step to the plate" and lead when appropriate. Because we observe and measure the educational benefits of GraSUS-developed methods and tools, we are excited to take the lead and spread them as widely as possible in many ways, from sharing with a teacher in the same school to sharing with the nation through national meetings. I am convinced that this program can become an integral part of a seamless educational model for the nation.

Although at one time I compared GraSUS to an interstate highway with knowledge, skills, and educational tools traveling in both directions – to and from NDSU, I now see it as a network of highways connecting the many GraSUS collaborators and many exits allowing for the improvement of SMET education far beyond the GraSUS boundaries. Although I have been at NDSU for almost 37 years, my involvement in GraSUS has been most important in helping me grow, learn, and understand what it really means to be a university professor – what it means to be part of a true collaborative network where everyone is a teacher, a learner, and a leader.

Point of View – by Robin Nelson

Robin Nelson is a member of the GraSUS Advisory Board

As a Fargo school board member, active community member and parent, I have learned vital ingredients to positive community evolvement are open minds, quality education, high energy and fresh ideas. Additionally, healthy communities take full advantage of local partnerships. The GraSUS program is a nicely-packaged combination of all of these.

I jumped at the invitation to join the GraSUS board since its arrangement solidly enhances education by bringing together NDSU science, technology, engineering and mathematics faculty and students to our community's secondary faculty and students.

In order to insure pre-requisite knowledge to STEM degrees, the seeds of excitement for STEM studies should be planted by middle and high school levels. Throughout those years, there are progressive opportunities for elective classes. For many students, the GraSUS project has served as a catalyst to enroll in higher-level science and math courses at the secondary level.

Additionally, with the recent national emphasis to promote STEM students, the birth of this program couldn't be more beneficially timed. There is clearly a need for more science, technology, engineering and mathematics degrees. With the current surge of technology-based companies in our area, it is absolutely necessary to exploit the occurring momentum to support their local sustainability.

Shortly after joining this board, my first delightful surprise was the excitement exuded by the middle and high school students whose teachers opted to integrate the GraSUS students into their curriculum. The NDSU students serve as infectious role models who are excited about learning and sharing knowledge with others. The impression these graduate and under-graduate students can make upon their younger protégés, whose ages are near those of their own, is greatly appreciated by teachers as it brings another relationship dynamic to their classrooms.

Another appealing asset to teachers is the flexibility of the program – it is clearly teacher-driven. Not only are the participating teachers gaining an energized partner to connect with their students, they themselves are absorbing new ideas, technology, and approaches. If there is desire to add punch in a specific piece of their curriculum, teachers can request the GraSUS student to focus on a targeted project. The added value to the curriculum benefits everyone.

An unexpected outcome is being experienced by the participating graduate and under-graduate students. All came in with a passion for a STEM subject, but several are also developing a desire to enter the teaching profession. The No Child Left Behind legislation for public schools mandates highly qualified teachers in their core areas of instruction. This legislation particularly causes logistical issues of the different sciences in the smaller school districts of our region.

GraSUS is a win-win for everyone involved, and continues to indirectly impact the rest of the community as well. I have determined there are priceless benefits for it to be sustained past the time when the initial grant monies are exhausted. It is a program that merits continuance, and one of which I am proud to be a player.

GraSUS-II Advisory Board

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Best Practices and GraSUS

Bill Martin is Professor and Head in the NDSU School of Education and a Professor in the Department of Mathematics. He serves as Co-PI for the GraSUS Project.

Kim McVicar is the Educational Project Specialist for the GraSUS Project. She is a National Board Certified Teacher in Adolescent and Young Adulthood Science.

A good description of best practices can be found in the **Five Core Propositions** proposed in the policy statement *"What Teachers Should Know and Be Able to Do"* (1989, National Board for Professional Teaching Standards). These core propositions are the foundation of National Board Certification, and are used by school districts, states, colleges and universities to ensure the strength of teacher preparation and continuing education programs. GraSUS provides several examples of best practices.

Proposition 2: Teachers Know the Subjects They Teach and How to Teach Those Subjects to Students. GraSUS Teachers have opportunities to expand their knowledge and experience in their content areas through their interaction with a GraSUS fellow. Fellows are advanced students in a science, math, or engineering discipline who are able to share the latest findings within their fields with students and teachers. For example, this year Joe Allen, Diana Beck, Darci Block, Evan Lampert, Lindsay Merchant and Andrew Podoll have all presented their current research in their classrooms. The Fellows often bring specimens and equipment that might not otherwise be available in a high or middle school classroom.

Proposition 3: Teachers are Responsible for Managing and Monitoring Student Learning. GraSUS teachers ensure that educational standards guide activities developed by their fellow. Together, they develop new and innovative approaches to help students gain important science and mathematics concepts. This team-approach has proven to be very effective in using inquiry to promote student interaction, engagement and learning.

Assessment, including pre- and post-testing, is critical to assess how well activities help students meet learning objectives established by project participants. Fellows and teachers have been encouraged and supported in a focus on the key theme of assessment during seminars and summer academy sessions this year.

Proposition 4: Teachers Think Systematically About Their Practice and Learn from Experience. GraSUS gives teachers and fellows increased opportunities to be reflective practitioners. The team structure requires collaboration and discussion of data collected during lesson implementation. In addition to team planning at each site, teachers and fellows report and reflect on project activities during monthly meetings of project participants.

Proposition 5: Teachers are Members of Learning Communities. Excellent examples of collaborative learning communities are found within the GraSUS project. One such example is found in the West Fargo High School Science Department. Members of this department have been active in GraSUS since the inception of the project nearly 6 years ago. Projects developed by GraSUS Fellows and teachers are shared department-wide and used by all teachers in a particular discipline. Recently, Joe Allen gave an introduction to cardiac physiology to all of the WFHS Biology students, explaining how an EKG works along with a lab activity in which students could observe the operation of an EKG machine.

Another great example of this type of effort recently took place at Fargo South High School. Darci Block and Carol Beaton prepared the AP Chemistry students to demonstrate various Organic Chemistry principles in all sections of regular Chemistry. Such projects require receptive, supportive teachers who are dedicated to sharing good ideas and taking advantage of resources. GraSUS has enhanced existing learning communities through the presence and efforts of GraSUS Fellows and NDSU faculty.

It is clear that GraSUS has promoted best practices in schools as teachers work collaboratively with graduate fellows and university faculty to improve student learning in their classes. The placement of GraSUS Fellows in schools helps to generate a professional culture that supports and accommodates best practices. By addressing core propositions promulgated by the National Board for Professional Teaching Standards, the impact of the project has gone far beyond the development of a few enrichment activities.

An Interview with Katie Reindl

Katie Reindl,
2004-2005
GraSUS-II
Graduate Fellow

Katie Reindl was a GraSUS-II graduate fellow during the 2004-2005 school year. She worked in the Biology department at West Fargo High School with Joan Baltezore, Sara Forness, and Pam Thompson. Katie is now working as a Post-Doc, doing research in Endocrinology in the Department of Biological Sciences with Dr. Mark Sheridan. She is looking forward to her first college teaching assignment this spring, as she will be teaching Cell Biology.

Katie Reindl thought that as a GraSUS-II fellow, she would be there to support teachers and assist them in daily activities. Katie found her experience to be that and much more. The level of independence Katie got to exercise as a Fellow was a pleasant surprise. Katie found that developing the activities herself and then eventually implementing them in the classroom gave her the opportunity to be creative. Katie found the team of teachers she worked with to be receptive and open to her ideas.

Learning from the challenges presented by the experience is one of the greatest benefits: "It was challenging to manage the time between contributing in the classroom and my research. GraSUS is demanding, and finding time to be both a student and a teacher was difficult. Also, it took awhile for students to know if they could trust me. Once I got to know them, they were willing to let me help them and they respected what I could bring to the classroom."

I asked Katie to comment on some of the GraSUS-II goals in relation to her personal experience:

- Goal 1: *Enriched Learning by Grades 6-12 SM Students*
  "Having a Fellow in the classroom adds a new resource of knowledge and experiences that enhances student learning. A fellow can bring greater depth of knowledge to a particular topic because of their research expertise or current study of such topics at a more advanced level…I spent a lot of time developing lessons that my teachers didn't have time to develop on their own. After I finished a project, my cooperating teachers would provide their input, resulting in an activity that was even stronger than either of us could have developed on our own. Because of my everyday contact with biology research, I was able to bring fresh, exciting activities to the classroom"
- Goal 2: *Improved Communication and Teaching Skills of GraSUS Fellows*
  "As a result of this experience, I feel more comfortable in front of an audience. I definitely improved in my communication skills, both verbal and written. Another benefit of GraSUS was learning to practice clear, concise communications with teachers."
- Goal 4: *Strengthened Partnerships between NDSU and School Districts*
  "Asking faculty members for resources was a way for me to share with them what the GraSUS-II project was all about . . . It helped to promote the program to other faculty members . . . In my conversations with faculty members, they were always interested in hearing about what we were doing in the project. The program has benefits for the teachers and the schools; because we are getting them materials and resources they would not otherwise have access to."

Katie appreciated the rewards of the experience. "Anytime we did a lab experiment that tied in with the lectures in class, the students got really excited to learn in a hands-on way . . . I was also excited when one of the female students had decided that she may be interested in science as a career because of what I was bringing into the classroom."

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Lisa Montplaisir
Biological Sciences, NDSU

Michelle Bertcsh
Lead Teacher
Fargo North High School Math Teacher

Sara Forness
Lead Teacher
West Fargo High School Biology Teacher

Steve Kennedy
Lead Teacher
South Fargo High School Physics Teacher

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The National Science Foundation
North Dakota State University

The GraSUS-II Project also graciously acknowledges the support and participation of teachers and administrators in cooperating schools:
Ben Franklin Middle School
Fargo North High School
Fargo South High School
Kindred High School
Moorhead Horizon Middle School
West Fargo High School

An Interview with Justin Hoey

Justin Hoey

Justin Hoey was a GraSUS-II Graduate Fellow during the 2005-2006 school year. He worked with Jerry Christianson and David Gravdahl at West Fargo High School. Currently, Justin is working on completion of his Master's Degree. He also works at the Center for Nanoscale Science and Engineering. Justin is looking toward the future, planning on a full time job or upon furthering his education. Recently, I visited with Justin and asked him to share a little about his experience as a Fellow.

Justin Hoey decided to pursue a GraSUS Fellowship because of his desire to gain more experience with teaching. He knew that he enjoyed working with kids and liked challenges so he decided the GraSUS project would be a good fit. When Justin started as a GraSUS-II Fellow, he knew a little bit about how the project worked because he knew another student who had also been a Fellow. Even with that familiarity, there were surprises for Justin when he started his work as a Fellow.

One of the things that Justin discovered was that he was given a lot of freedom by the teachers to develop his own ideas and turn them into projects that could be done in the classroom. This was a very enjoyable aspect for him. He also appreciated the interaction with the students. The time spent with students, helping them with homework and labs was instrumental in building solid rapport. Justin was especially pleased this fall when he discovered that one of his former students from West Fargo High School is pursuing an Engineering degree here at NDSU.

"One of the greatest rewards was that I could work with the kids and watch as they were learning. Seeing that little light bulb go off was exciting. I liked getting to "go and play" as part of my job. Liked being able to connect with younger students and look at 'what I would have wanted to know" coming into college and bring that to them. I wanted to challenge them to learn, and treat them like they knew something, not just feeding them the answer."

The experience had challenges too. "One of the hardest things for me was not giving them the answers right away… I learned to let them struggle with problems to help them learn it."

Justin summarized some of his best memories of the experience as we finished our visit: "I enjoyed setting up the wind tower with the kids – constructing it in the wind and seeing that we could all work together and accomplish something . . . I also enjoyed doing the circuit/speaker lab . . . I made it challenging, and I enjoyed it when the students would come in and ask me about it. I liked talking to them one-on -one."

Portrait of a GraSUS-II Teacher – Carol Beaton

Like other GraSUS teachers, Carol Beaton dedicates time toward the project while maintaining many other responsibilities. She teaches Chemistry and AP Chemistry at Fargo South, and works on the Fargo Public Schools District Tech Initiative and the FPS Science Study Committee.

This is Carol's third year in the GraSUS-II program. She worked with David Schultz, an undergraduate Fellow, during the 2004-2005 and 2005-2006 school years. David is currently student-teaching in Chemistry at Moorhead High. David shared this reflection about Carol: "The best part about working with Carol Beaton was learning how to develop a rapport with the students and colleagues and learning the nuances of the teaching profession. I feel that the knowledge and experience I gained from working with her will assist me in my future."

Carol is currently working with Darci Block, a graduate Fellow. Darci and Carol share a passion for Chemistry. Darci noted that "The best thing about working with Carol is her enthusiasm about the students and learning about Chemistry. She is so organized and has an ability to make things happen. She is persistent and wants to see good things happen."

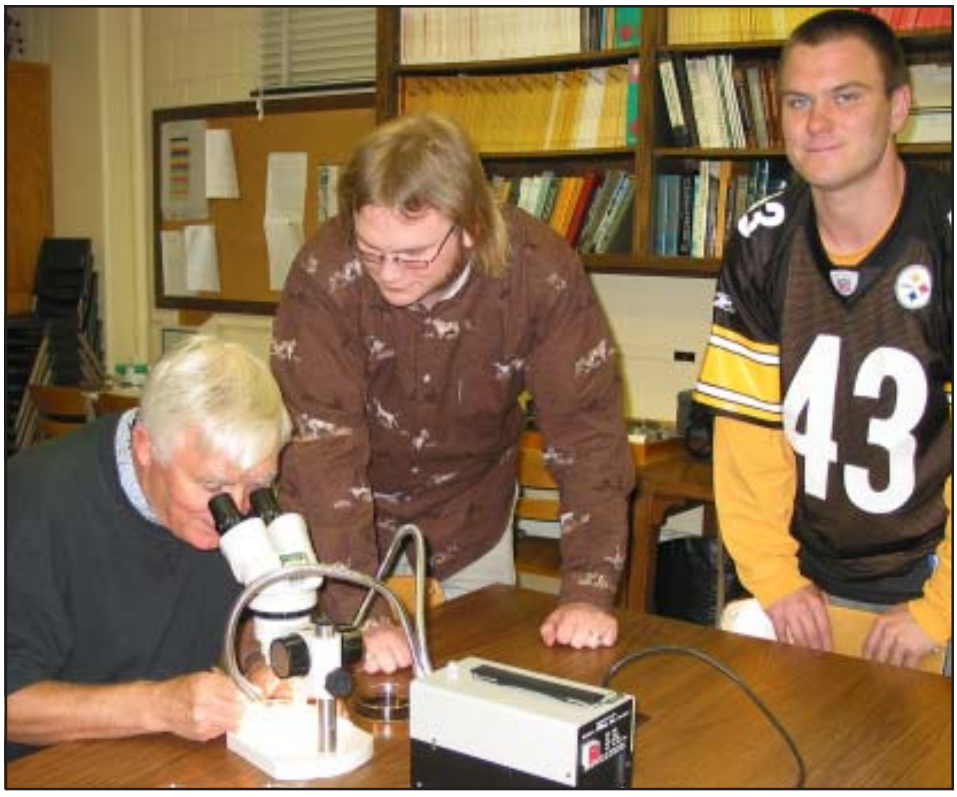
Carol exemplifies the qualities of successful GraSUS teachers: committed, knowledgeable and passionate about the subject they teach. Thank you for your dedication, Carol!

GraSUS Gallery

GraSUS fellows and teachers study assessment strategies during the Summer Academy.

Cantilever Construction – from left to right, Michelle Bertsch, Nathan Carr and Jayson Poppinga constructing a cantilever during the Summer Academy.

Barry Olson searches for fossilized organisms in sediments during the September Seminar.



Dr. Allan Ashworth, NDSU Geosciences confirms the identity of a specimen for Joe Allen and Evan Lampert.

Teacher-Fellow Teams 2006-2007

Teacher	Fellow	School	Subjects
Jayson Poppinga	Nathan Carr *(Veterinary and Microbiological Sciences – Undergrad)*	Fargo South	Biology
Carol Beaton	Darci Block *(Chemistry – Grad)*	Fargo South	Chemistry, AP Chemistry
Harvey Kruckenberg	Haley Watson *(Civil Engineering – Undergrad)*	Fargo South	Physics, Chemistry
Steve Kennedy	Nicci Schaible *(Electrical Engineering – Undergrad)*	Fargo South	Physics, AP Physics
Michelle Bertsch	Dana Powell *(Math/ Math Education – Undergrad)*	Fargo North	Adv. Math, Alg. II
Joe Bailey and Aaron Tank	Daniel Eiler *(Biotechnology and Chemistry – Undergrad)*	West Fargo	Bailey – Biology / AP Biology Tank – Chemistry
Sara Forness and Jill Wold	Joe Allen *(Environmental and Conservation Science – Grad)*	West Fargo	Forness – Biology, Env. Science Wold – Biology
Laura Bartsch and Mary Jo McKay	Lindsay Merchant *(Math – Grad)*	West Fargo	Bartsch – Pre-Algebra, Algebra, Geometry McKay – Basic Math, ELL
Barry Olson	Andrew Podoll *(Geosciences – Undergrad)*	Ben Franklin Middle School	Earth Science
Bob Taylor	Evan Lampert *(Entomology – Grad)*	Kindred High School	Anatomy, Biology, Earth Science
Lisa Erpelding	Diana Beck *(Math – Grad)*	Moorhead Horizon	Math 8, Algebra I

Focus on a Successful Partnership

There are characteristics of partnerships that can make them more productive. GraSUS partnerships bring together teachers who have specific training in pedagogy and methods, and science, math, or engineering majors who have special preparation and background within a content area, but little or no background in pedagogy. This unusual combination has the potential to make a dramatically positive impact on the students in the classroom, but it takes special people to make it work.

Mary Jo McKay and Lindsay Merchant worked together during the Fall Semester at West Fargo High School. Mary Jo teaches Basic Math and ELL Math. Lindsay is a graduate student in Mathematics. When Mary Jo and Lindsay were asked about how they make their partnership work so well, both of them identified "immersion of the Fellow into the classroom" as the most important factor. Lindsay noted that "It is really beneficial to the students when the teacher allows the fellow to explain things from a different perspective." Mary Jo added this: "The success of our partnership had to do with the "Team-Teaching" effort. Lindsay became a part of my classes and was considered a second teacher in the room. Learning the students' names and discovering their strengths, as well as their weaknesses, was something that seemed to come natural to Lindsay."

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GraSUS Fellows Notable News

Joseph Allen: Harvey K. Nelson Graduate Scholarship 2007

Darci Block: Will represent GraSUS along with her cooperating teacher, Carol Beaton, at the 7th Annual Meeting for GK-12 Projects in Washington, DC from March 9-11. Recipient of the Roy Milde Fellowship Award for 2006-2007.

Nathan Carr: Hector Clay Memorial Scholarship. Recent publication: Besemann, C., A. Denton, N.J. Carr, and B.M. Pruess. 2006. BISON: bio-interface for the semi-global analysis of network patterns. Source Code for Biology and Medicine. 1:8.

Daniel Eiler: Presenting at the American Chemical Society National Meeting and Exposition March 23-29 in Chicago.

Evan Lampert: Beatty-Munro Award in Entomology; Mark and Mary Andrews Scholarship. Presented at the Entomological Society of America meeting in Indianapolis in December.

Lindsay Merchant: Attending the Graduate Student Combinatorics conference at the University of Washington in Seattle, in April. Received the Lillian Goettler NASA Space Grant from ND Space Grant consortium, an NDSU mathematics Departmental Scholarship, and a 4th yr. Presidential Scholarship. Alpha Gamma Delta Scholar of the Month – November 2007

Andrew Podoll: Recently returned from a 2-month expedition in the Western Dry Valleys of the Transantarctic Mountains, Antarctica. Andrew was a member of a team of scientists led by Dr. Allan Ashworth which included another NDSU undergrad, Kelly Gorz. During the expedition, the team conducted two live video-conferences which connected them with the students at Ben Franklin Middle School in Fargo. These live conferences were the first of their kind to be conducted from McMurdo Station in the Antarctic. Andrew and his cooperating teacher, Barry Olson will be attending the AAAS-Swarm Conference in Houston in April.

Dana Powell: Anderson/Hill Math Scholarship

Haley Watson: Presented with the NDSU Student Chapter of the Water Environment Federation at WEFTEC (Water Environment Federation Technical Exhibition and Conference) in Dallas, Texas. The NDSU team presented their project on Sanitary Sewer Overflow Management for the City of Fargo, N.D. The NDSU team placed third in the Nation.