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# Noyce Science Teacher Master of Arts with emphasis in Science Teaching Program: Meeting Challenges of 21st Century Classrooms. UNL Noyce Track I, Phase I, Final Report.

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# **NOYCE SCIENCE TEACHERS**

**Master of Arts with emphasis  
in Science Teaching Program**

*Meeting Challenges of 21st Century Classrooms*



UNIVERSITY OF NEBRASKA-LINCOLN  
Robert Noyce Teacher Scholarship Program





## Message from Elizabeth Lewis



### **Dr. Elizabeth Lewis**

Noyce Science Teacher Grant, Principal Investigator; Associate Professor, Science Education, Department of Teaching, Learning, and Teacher Education, University of Nebraska-Lincoln

**I**n conjunction with my science and science education colleagues and three colleges at the University of Nebraska-Lincoln (UNL), we are pleased to present a final summary of the results and accomplishments of the National Science Foundation (NSF) Robert Noyce, Track I, Phase I grant awarded to UNL in September 2010. We hope you enjoy reading about the fruits of this project.

It has been a productive six years. When we applied for the Noyce grant, we were acutely aware of both the state's and the nation's need for more science teachers. Prior to being awarded our Noyce Science Teacher grant, we determined that in Nebraska there had not been as many teachers prepared to be endorsed as single-subject (e.g., biology, chemistry, physics, or Earth and space science teachers) as there had been general science endorsements. Thus, a major outcome of the grant's activities

has been to recruit individuals with strong science backgrounds to become secondary science teachers. By the end of the grant in August 2016, 60 post-baccalaureate science majors and professionals were provided with Noyce stipends ranging from \$12,000 to \$15,000 to become science teachers.

As a part of this NSF-supported project we designed and implemented a new secondary science teacher education program to update the historically 18- to 24-month program that resulted in teacher certification, but not a master's degree. Thus, the 14-month Master of Arts with emphasis in science teaching (MAst) program was established in the UNL College of Education's Department of Teaching, Learning, and Teacher Education. The MAst program engages science professionals in a research-informed program of study that supports them in meeting the challenges of the modern American secondary science classroom. We have been very fortunate to have strong partners in both Lincoln and Omaha Public Schools and their veteran science teachers who have graciously opened their classrooms and shared their expertise with a new generation of science teachers.

In terms of setting a strong foundation for long-term teacher professional development, funding from the Noyce grant was also used to send stipend recipients to NSF-sponsored regional and national Noyce conferences. All stipend recipients received support to attend the statewide Nebraska Association of Teachers of Science annual conference. Some preservice

teachers were also provided funding to attend regional and national conferences hosted by the National Science Teachers Association. Additionally, ancillary funds were provided by a UNL internal Program of Excellence grant to develop a New Teacher Network that supported MAst graduates during their first years of teaching.

The MAst program is now in its sixth year, producing an average of 10 new science teachers per year. From our longitudinal study of our graduates we have found that over time, MAst alumni teachers have maintained a positive outlook on their agency as effective teachers of science. We attribute the positive nature of these beginning science teachers' self-efficacy to a rigorous teacher preparation program. It is with pride that we can say many of our preservice science teachers who graduated in 2012 and 2013 are now in their fourth and fifth years of teaching. Additionally, many of these Noyce-supported alumni science teachers are now department chairs and mentoring their own student teachers.

This project has been an exciting time for all of us here at UNL, and we are delighted to continue our efforts to raise the bar in science education with a second Noyce grant awarded in September 2015 to support 30 more individuals to become science teachers. We appreciate NSF's vote of confidence in our good works here in Nebraska and the many other states where our graduates are teaching science.

*In the spirit of education,*

*Elizabeth B. Lewis*



# Program produces more highly qualified teachers

**T**he Master of Arts with emphasis in science teaching (MAst) program at the University of Nebraska-Lincoln, with the support of the Robert Noyce Teacher Scholarship Program at the National Science Foundation, grew out of a well-documented national and local need to increase both the quality and quantity of secondary science educators in the educational system. The United States faces increased pressure to train a dynamic workforce in the global marketplace. Students' scientific literacy is considered central to increasing U.S. competitiveness in STEM fields.

The field of science is multi-disciplinary. Prior to 2011, Nebraska was low in the number of within-field-endorsed teachers in the four core areas of science. Without highly qualified science teachers, students' science achievements cannot grow. The MAst program was implemented to counteract the low numbers of highly qualified science educators in Nebraska.

Annual endorsement data from the Nebraska Department of Education (NDE; see Table 1, page 4) shows that since the inception of the MAst program, more highly qualified science teachers have been produced. As can be seen in the table, within the UNL system, and other Nebraska teacher education institutions, graduation and certification figures in certain subfields of the sciences, such as physics, chemistry, and Earth science, have lagged historically, but are improving gradually.

This intensive 14-month

science-focused certification and master's degree program is the result of the leadership of the UNL College of Education and Human Sciences, as well as the support of two other colleges, the College of Arts and Sciences and the College of Agricultural Sciences and Natural Resources. Through the NSF and Noyce program, sizable stipends\* are awarded to the scholars, which pay for all of the tuition for the MAst program. In turn, Noyce stipend recipients agree to teach for two years in a high-needs school district in the United States. In the first five cohorts, about 70% of MAst graduates have stayed in Nebraska to teach science.

The MAst program is a full-time, 42-credit hour program that students complete as part of a cohort. The goal is to engage science professionals (those individuals with at least a baccalaureate degree) in a sequence of courses and field

\*\$12,000-\$15,000

*"After practicing medicine and working with medical software for almost three decades, I decided I wanted to move back to my hometown and teach science. Instead of telling me I was too old, or asking, 'Are you crazy?,' the MAst program at UNL was actually tailor-made for what I wanted to do, and the NSF Robert Noyce Scholarship helped make it possible. I'm not sure that I would have taken the leap to do this if I was looking at a traditional program requiring multiple years and the related expenses."*

**Vicky Boone**  
Johnson County  
Central High School,  
Tecumseh, Nebraska

**Table 1. Number of Nebraska Teacher Endorsements (Initial or Added) Awarded by Year**

(# = does not include additional endorsements to already certified teachers; \* = retired endorsements; Note: Teachers may have applied for multiple initial science teaching endorsements.)

Year Endorsement	2015-16#			2014-15#			2013-14#			2012-13			2011-12		
	UNL	NE	%UNL	UNL	NE	%UNL	UNL	NE	%UNL	UNL	NE	%UNL	UNL	NE	%UNL
Biology	4	14	28.57	8	27	29.63	7	24	29.17	16	47	34.04	10	29	34.48
Chemistry	1	3	33.33	6	16	37.50	6	18	33.33	9	22	40.91	4	8	50.00
Earth, space science	1	1	100.00	2	6	33.33	4	9	44.44	3	9	33.33	0	0	N/A
Physics	0	2	0.00	3	8	37.50	4	12	33.33	1	10	10.00	3	4	75.00
Science (General)	8	39	20.51	15	59	25.42	20	52	38.46	25	55	45.45	N/A	N/A	N/A
Physical Science*	Discontinued			Discontinued			Discontinued			Discontinued			2	5	40.00
Natural Science*	Discontinued			Discontinued			Discontinued			Discontinued			24	45	53.33
<b>Total</b>	<b>14</b>	<b>82</b>	<b>17.07</b>	<b>34</b>	<b>142</b>	<b>23.94</b>	<b>42</b>	<b>133</b>	<b>31.58</b>	<b>54</b>	<b>167</b>	<b>32.34</b>	<b>46</b>	<b>111</b>	<b>41.44</b>

experiences from which these preservice teachers can acquire the knowledge, skills, and dispositions required for today's diverse secondary science classroom environments.

The MAst program transforms individuals with science degrees, as well as practicing scientists, into educators; builds on their passion for science; and adds pedagogical and action research methods to their toolkits. They learn to create activities and projects that engage students, break down a complicated process into steps for lab experiments, and conduct and analyze educational research for their own instructional improvement.

This teacher education program is grounded in educational research. Several key assumptions of the program are based on the research literature:

- Students come to the classroom with prior knowledge that must be addressed if teaching is to be effective,
- Students need to organize and use knowledge conceptually if they are to apply it beyond the classroom, and
- Students learn more effectively if they understand how they learn and how they manage their own learning (Darling-Hammond, 2006, p. 9).

The Department of Teaching,

*“By preparing professional educators, the MAst program has improved the instruction of the curriculum in our district.”*

**James Blake**  
**Science Curriculum**  
**Coordinator, Lincoln**  
**Public Schools, Nebraska**

Learning and Teacher Education has developed and continues to implement a high-quality program that produces exemplary secondary science teachers. The vast majority, nearly 96%, of the participants complete the program and acquire teacher certification. Noyce recipients are then required to teach for two years in a high-needs school district within their first four years.

Teachers have an extensive amount of time in the classroom. These preservice teachers (PSTs) spend more than 600 hours honing their craft, exiting the program with invaluable clinical field experience. They begin with a summer school experience. In the fall, PSTs move into a more formal classroom setting with a fall practicum and spring student teaching internship, where PSTs engage in intense classroom involvement, apprenticing with a cooperating teacher. Student teaching begins

in the spring semester and after completing the second science teaching methods course. Thus, PSTs have the opportunity to apply the research and theory from their coursework and process the connection between theory, methods, and practice.

PSTs have many course experiences that prepare them for their roles as science educators. PSTs use their coursework to reflect on and improve upon their praxis. Teachers found the MAst courses (see Table 2, pg. 6) to be helpful for them to channel and convey science to and with others effectively. Of particular practical use were the courses Secondary Science Methods I & II and Teaching English Language Learners in Content Areas. The methods courses included research-based theory with practical application. The PSTs were especially drawn to the practical aspects, such as ways to engage students and methods for discussion about scientific issues and ideas.

Students also learned to be critical consumers of educational research. Basic types of research approaches were taught, especially teacher action research. MAst teachers conducted their own action research during student teaching to earn their Master of Arts degrees. ■

# Q&A with ... *Vicky Boone*



*Vicky Boone is starting her third year as a science teacher at Johnson County Central High School in Tecumseh,*

*Nebraska. Last year, she taught biology for sophomores and had juniors and seniors for anatomy and physiology and biology II, both of which can be taken for dual credit through an affiliation with Peru State College. In 2016-17, she will keep the anatomy and physiology course, but will teach chemistry and physics. Originally from Elk Creek, Nebraska, and a graduate of the high school at which she teaches, Vicky earned a bachelor's degree in chemistry and life sciences and a master's in software engineering from UNL, as well as a doctorate of medicine from the University of Nebraska Medical Center and completed her residency in obstetrics and gynecology. Vicky shares her experiences with us in this Q&A.*

## **How did you feel about science when you were a K-12 student?**

Math and science were my favorite subjects. I was a bit concerned my sophomore year because I was certain I would not be able to dissect anything! Fortunately, I had an awesome biology teacher and not only did I discover I was able to dissect worms and frogs, but also that doing surgery and delivering babies were my favorite parts of practicing medicine.

## **How have your parents' professions influenced you?**

My father is a farmer, and my mom was at home when we were growing up. Mom started college the same year I did and became an RN. Neither of my parents had the opportunity to go to college when they graduated from high school, but they made it a priority to make sure my brother and I would be able to go. My brother became a mechanical engineer, and I went into medicine. I will always be grateful for their support and encouragement for everything we wanted to do. It is certainly easier to be successful when you have that kind of support from your family and your teachers. This was especially important to me, as women were only just beginning to be accepted into medical schools when I graduated from high school.

## **What made you decide to become a science teacher through Noyce and MASt?**

After I retired from medicine, I received a degree in software engineering through the J.D. Edwards program at UNL and worked for several companies doing medical software and business intelligence software for hospitals, and other applications, for about 10 years. One day I realized my favorite part of the job was not simply building the software, but teaching others how to use it. As my thoughts turned to teaching, I thought about how lucky I was to have had exceptional math and science teachers

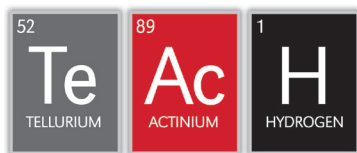
during high school. I decided I would like to move back home and find a job teaching, so I went online to see if UNL had an accelerated program and discovered the MASt program. I was a little too late to apply for the first cohort, but was fortunate to be chosen for the second cohort.

## **How has the MASt program prepared you for teaching?**

Despite the quick nature of the program, we were as well prepared as other first-year teachers. There is a tremendous amount of learning that, by necessity, takes place during student teaching and the first few years of classroom teaching. These years are similar to a residency in medicine; the only way to really "learn" something is by actually doing it.

## **What are your future goals in your teaching career?**

I hope to stay at JCC until I retire. We have such awesome students, a diverse student body, and supportive administration. I am looking forward to offering more dual-credit courses and continue to look for opportunities to immerse students in "real-life" science where they have a chance to partner with professionals in science, medicine, and technology. We had a chance to do some of this my first year teaching when we were accepted to be part of the Student Spaceflight Experiment Program, where students sent an experiment to the International Space Station. ■



# MAst coursework

*MAst program coursework emphasizes how to teach diverse students. The two methods courses are taught concurrently with the first two practicum internships, and assignments are integrated between theory and practice. The master's-level pedagogical inquiry capstone project is built on a problem of practice in science curriculum, instruction, and/or assessment. Inquiry-based instruction is interwoven throughout the program.*

**Table 2.**

Master of Arts with emphasis in science teaching Program of Study (42 credit hours)														
May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	
Summer 1				Fall				Spring				Summer 2		
TEAC 851V: Secondary Science Methods I (3 cr)				TEAC 852V: Secondary Science Methods II (3 cr)				TEAC 897V: Student Teaching Secondary Science (4 cr)				TEAC 889: Masters Seminar (2 cr)		TEAC 801: Curriculum Inquiry Seminar (3 cr)
TEAC 894V: Practicum (1 cr)				TEAC 894V: Practicum (1 cr)				TEAC 880A: Instructional Technology (3 cr)						
SPED 801B: Special Education for Teachers (3 cr)		TEAC 861: Education for a Pluralistic Society (3 cr)		EDPS 851: Adolescent Development and Cognition (3 cr)				TEAC 803B: Student Teaching Seminar (3 cr)						
		TEAC 813M: Teaching ELLs in Content Areas (3 cr)		TEAC 800: Inquiry into Teaching and Learning (3 cr)				TEAC 889: Masters Seminar (1 cr)						
				TEAC 841: Content Area Reading (3 cr)										
<b>Total Credit Hours: 13</b>				<b>Total Credit Hours: 13</b>				<b>Total Credit Hours: 11</b>				<b>Total Hours: 5</b>		



# A model of teacher education

**D**arling-Hammond and Bransford (2007) identified three important areas of teachers' professional practice in terms of their skills, knowledge, and dispositions (see Figure 1): "(a) knowledge of learners: how they learn and develop within social contexts; (b) conceptions of curriculum content and goals: an understanding of the subject matter and skills to be taught in light of the social purpose of education; and (c) an understanding of teaching in light of the content and learners to be taught, as informed by assessment and supported by classroom environments" (p. 11). This study focused on understanding beginning secondary science teachers' practices and self-reflection of their instructional practices used in a science lesson.

MAst teachers demonstrate knowledge improvement, increased confidence, greater levels of preparedness, and positive attitudes related to science in myriad ways.

Because PSTs have had a multitude of experiences working directly with students and experienced teachers in schools, they are well prepared for work as classroom teachers. PSTs often speak about their practical application, such as in-field experiences and student teaching, as being critical to their success.

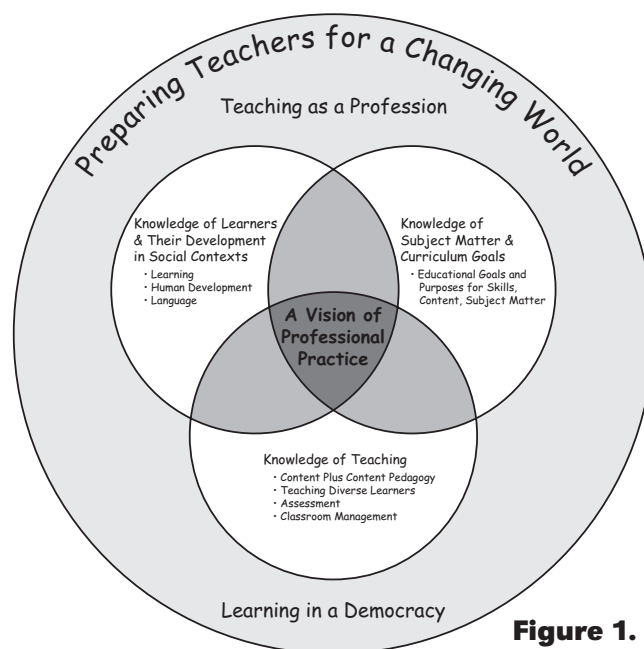
During their lengthy internship experience, PSTs were presented with practical challenges to work through: reaching students of

differing abilities, designing and teaching lessons that accommodate students with special needs through honors courses, teaching students who are less motivated to learn science, handling chronic student absences, working with teams of teachers on common assessments, and classroom management issues.

Through the program, PSTs learned how to craft lessons and build students' critical thinking skills through inquiry-based learning. They learned to teach by doing and being carefully mentored at each stage by program instructors and cooperating teachers.

MAst teachers demonstrate their command of pedagogy by articulating how they plan, implement, and refine their lessons in the classroom.

Another element of the teaching apprenticeship is the dynamic interplay among the mentors and classrooms. All elements – faculty member mentor, student teacher supervisor, cooperating teacher, preservice peer teacher learners, pedagogical practices and research-based literature, and classroom teaching



**Figure 1.**

experience – are important pieces of what shapes a MAst teacher's beliefs and skills.

The Noyce grant has supported follow-up studies of teacher effectiveness, which also has facilitated ongoing feedback on MAst graduates' teaching. This prolonged exposure creates a deep sense of trust that is conducive to learning. The PSTs also share their triumphs and challenges with their peers. They listen to the tailored feedback from their cooperating teachers and university student teacher supervisors on their teaching methods. They discuss pedagogy, theory, and research with their advisor and mentor in their college classroom. Once they land their first teaching position, MAst teachers are well prepared to motivate and inspire their students to learn science. ■

# Q&A with ... *Nate Van Meter*

*Nate Van Meter is starting his fifth year as a sixth-, seventh- and eighth-grade teacher of science at Louisville Middle School in Louisville, Nebraska. Originally from Gibbon, Nebraska, he earned a bachelor's degree in fisheries and wildlife management from UNL before joining the MASt program. Nate shares his experiences with us in this Q&A.*

## **How did you feel about science when you were a K-12 student?**

I was interested in science at a young age, but my interest was focused almost entirely on what I later learned was ecology. My father is an avid outdoorsman, and he passed on to me a passion for hunting and fishing, and this led to an interest in studying animals and their habitats.

## **How have your parents' professions influenced you?**

Both of my parents were educators. My mother taught high school English early in her career and then later became a high school media specialist. My father taught sixth grade and then spent 30 years as the elementary principal at Gibbon. With both of my parents in education, I certainly grew up with respect for the educational process. They also did a great job of showing me the value of working hard and being committed and passionate about what you do.

## **What made you decide to become a science teacher through Noyce and MASt?**

Until I saw the announcement for the Noyce/MASt program, I hadn't really considered the possibility of being a secondary science teacher. I had thought about the possibility



*Nate Van Meter stands on the very service arm that the Apollo 11 crew used to get in the command module during the Midwest Noyce conference at Kennedy Space Center in 2016.*

of getting into education, but more as a naturalist or outdoor educator in an informal education setting. Because of my undergraduate education, work experience, and my interest in the outdoors I felt like I had something to offer young people. The MASt program that UNL put together made me think seriously about the possibility of becoming a classroom teacher, and it gave me a clear path to make it happen. The MASt program gave me the confidence to leave a good job as a professional scientist to pursue a career in education.

## **How has the MASt program prepared you for teaching?**

The MASt program has done an exceptional job of preparing me to teach secondary science. If I had to narrow it down to one thing, it would have to be the opportunity to be surrounded by, and learn from, some exceptional science educators. This starts with the

faculty in the science education department at UNL. It also includes other graduate students who are part of the program and the exceptional cooperating teachers who help beginning teachers enter the classroom.

## **Which professional development opportunities have you taken advantage of from UNL?**

Since completing the MASt program, I have taken two courses through the Nebraska Math and Science Summer Institutes (Methods in Geoscience Field Instruction and Geology of the Solar System) to continue to increase my science content knowledge and improve my teaching skills. Those two courses and the 2016 Noyce regional conference held at the Kennedy Space Center were great because they helped me increase my science content knowledge and gave me lots of strategies for engaging students in the classroom. Others such as the spring 2016 MASt reunion were beneficial by focusing on teaching strategies such as classroom management, using technology, and formative assessment and feedback.

## **What are your future goals in your teaching career?**

My future goals as a teacher really come down to trying to be a better teacher tomorrow than I was today. I think good teachers continually strive to find new ways to engage students in the content, assess learning, and provide feedback that helps students learn and so those are things that I want to always be working to improve upon. ■



# Emphasis put on recruit, retain

**R**oads to choosing the MAsT program varied. Some preservice teachers (PSTs) continued their education directly after their undergraduate degree to become science teachers. Other applicants who had spent some time working were looking for a science career they considered rewarding. The MAsT program offered them a new direction to fulfill their goals. The Noyce stipend to pay for tuition and the short timeframe for a teaching career made the MAsT program an attractive path.

It is recognized that students who participate in “extended” teacher preparation programs such as the MAsT fare better than their counterparts in more traditional four-year programs (Zeichner & Conklin, 2005). Whether looking at job satisfaction, retention of teachers, or simply career satisfaction (i.e., whether they would choose teaching again), extended or “fifth-year” programs come out on top.

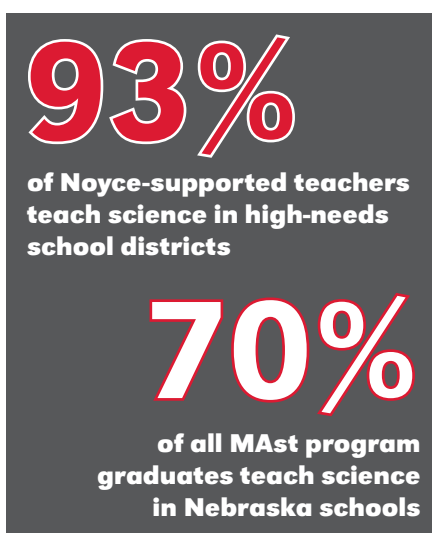
An important aspect of a post-baccalaureate degree is that students not only come to the program with a depth of knowledge through an undergraduate major in the sciences, but potentially with additional life experiences that contribute to their own and others’ learning. With that in mind, “exemplary teacher preparation programs should be both learning-centered and learner-centered” (Darling-Hammond, 2006, p. 7).

The MAsT program emphasizes continual personal improvement and the importance of building a network of individuals that can be called on to help create a more interesting activity, revise their assessment strategy, or adapt curriculum to another ability level. PSTs know they have a wide range



COURTESY PHOTO

*Cohort 3 graduates (2014), from left: Taylor Montgomery, Nikki Binderup, Noyce PI Elizabeth Lewis, Samantha Davis, Joshua Trujillo, and Kay Burbach.*



of people they could contact about what they are struggling with. Longstanding relationships, like

with the cooperating teacher, enable trust so that feedback is welcome.

MAsT applicants are fortunate to have influential individuals who encourage them to enter the teaching profession. As students, several had outstanding high school teachers with whom they are still in communication.

Program staff, faculty, and course instructors have noted MAsT students’ increasing confidence from the start to the end of the program.

PSTs gained creativity and resourcefulness that only comes with extensive lesson planning. They have layered their newly acquired teaching skills onto a solid foundation of science knowledge.



COURTESY PHOTO

Cohort 4 graduates (2015), back: Michael Schroeder, Tony DeGrand, Ethan Van Winkle, Mary Beth Bavitz, and Noyce PI Elizabeth Lewis; front: Jean Johnson, Victoria Freeman, and LaTravia Dobson

*“Learning how to self-assess was the most effective. I am constantly questioning how to make myself better, as well as how to make things better for my students.”*

**Leah Zohner**  
**Millard North High School,**  
**Omaha, Nebraska**

In interviews with an external evaluator, one PST stated: “I needed to have these [teaching] tools so that when I got up in front of the class I could just be myself.” Another PST stated that even with his extensive subject matter knowledge, he would not have known how to “figure out what I’m doing tomorrow” had he taken a teaching position prior to the program. Graduates of the MAST program have also shown growth during their induction years.

In the program, special effort was taken to ensure that MAST students spend time with students of diverse backgrounds. This, along with the Education for a Pluralistic Society and Teaching English Learners courses, has been instrumental in teachers feeling comfortable taking positions in school districts with diverse

student populations. PSTs learned to acknowledge differences and to do more to help reduce student marginalization.

Elizabeth Lewis, as coordinator of the MAST program, has observed that the program will continue to support MAST graduates’ growth as teachers over time.

In terms of retaining qualified, beginning in-service teachers working in high-needs schools, this program has excelled. The vast majority of those teaching have careers in high-needs schools serving the most vulnerable students.

By the end of the grant, the MAST program had awarded 53 Noyce stipends to students from 2011-2016, and 49 finished the program and graduated as of August 2016. Another seven stipends were awarded to Cohort 6 in May 2016,

but they will not finish the program until the summer of 2017.

Out of the 49 completers, 43 (87.7%) had been employed as secondary teachers and several more were subbing. A few other (n=3) graduates decided not to pursue teaching post-graduation.

When inspecting the group of 43 teachers working, there have been 40 (93%) who were employed as teachers in high-needs school districts. Out of the first three cohorts who had the potential to have completed their two-year service requirement of teaching in high-needs schools, 26 have finished it; this is 53% of all endorsed alumni (n=49). Beyond the two-year service requirement, 24 (93%) of those teachers who finished their commitment have continued working in high-needs schools. ■

**Table 3. Number of MAST Teachers Teaching in High-Needs School Districts**

(Summary of Noyce stipends awarded per cohort and teaching employment status until August 2016)

Cohort	Number of Noyce Stipends awarded (plus 7 in Cohort 6)	Number of teachers earned endorsement	Number of teachers employed	Number of teachers working in high-needs school districts
1	14	13	11	9
2	14	12	12	12
3	11	11	9	9
4	10	9	8	7
5	4	4	3	3
<b>Total</b>	<b>53</b>	<b>49</b>	<b>43</b>	<b>40</b>

# District partner LPS supports, benefits from MAst program

UNL's preservice science education program and post-baccalaureate M.A. program both provide outstanding experiences for students, preparing them to be high-quality teachers equipped to meet the high expectations of schools throughout Nebraska. The secondary science education program has led the way in the state and the nation on field experiences, including both formal and informal settings (zoos, after-school programs, summer science camps, museums, and diverse classrooms) and the use of technology.

A key element for the success of a program like the UNL MAst program is the relationship and collaboration that occurs among the colleges and the public schools. It takes both higher education and 7-12 institutions to educate an effective secondary science teacher.

There is a strong relationship between UNL and the Lincoln Public Schools (LPS), particularly in mathematics and science education. This is evident from the collaborative work that has occurred in recent years on NSF-funded projects such as NebraskaMATH and NebraskaNOYCE, for secondary mathematics teachers. LPS has been an outstanding partner and has supported MAst collaborations through active participation.

"Lincoln Public Schools has been a supportive and thoughtful partner with UNL in apprenticing

Noyce stipend recipients as well as all of our MAst preservice teachers," said associate professor and Noyce PI Elizabeth Lewis. "LPS science teachers have been gracious in welcoming and mentoring student teachers year after year. The district science curriculum coordinators and cooperating teachers have also helped shape the MAst program with their invaluable feedback on their interactions with preservice science teachers."

MAst students spend a full academic year with one or two cooperating teachers either at the middle school or high-school level, or both. LPS is the main location to place these preservice teachers. Students gradually build proficiency in teaching, adding responsibilities and developing skills, and are prepared to assume 14 weeks of full-time student teaching in the spring semester of their cohort year.

LPS Science Curriculum Specialist James Blake advises the MAst program, but also was previously one of its cooperating teachers.

"I had three student teachers from the MAst program when I was a cooperating teacher, and they were all amazing," Blake said. "As a direct result of their great performance, two were hired back into the same building they student taught in, and one

was hired right out of college in another district closer to home. I gave student teachers autonomy to do as much as they felt comfortable with as soon as they felt comfortable, and, every time, the MAst students were able to facilitate the class effectively from the first day of the semester."

Blake said LPS has been honored to offer strategic planning and evaluation input into the MAst program as a school district partner. "We recognize there is a need in Nebraska, as well as the nation, to determine sources of highly effective teaching," Blake said. "It isn't the standards or the curriculum that will lead to higher rates of student success in science; it is what happens between that student and teacher. By preparing professional educators, MAst has improved the instruction of the curriculum in our district."

Blake also has noticed that MAst teachers stand out in the district and are actively engaged as professionals.

"Having teachers who are learners makes a large impact in our PLC model, where teachers are meeting often to improve their practice," Blake said. "Science teacher graduates of the MAst program are easy to spot. They are quick to volunteer to be involved in development of opportunities such as the continuous curriculum improvement process and planning for science events, as they see the value of understanding how assessment, curriculum, and instruction are all connected." ■



James Blake

# Q&A with ... *Tony DeGrand*

*Tony DeGrand is starting his second year as a ninth-grade geoscience and physical science teacher at North Star High School in Lincoln, Nebraska. Originally from Wisconsin, he earned a bachelor's degree in atmospheric science from the University of Wisconsin-Milwaukee and worked as a broadcast meteorologist before entering the MAst program. Tony shares his experiences with us in this Q&A.*

## **How did you feel about science when you were a K-12 student?**

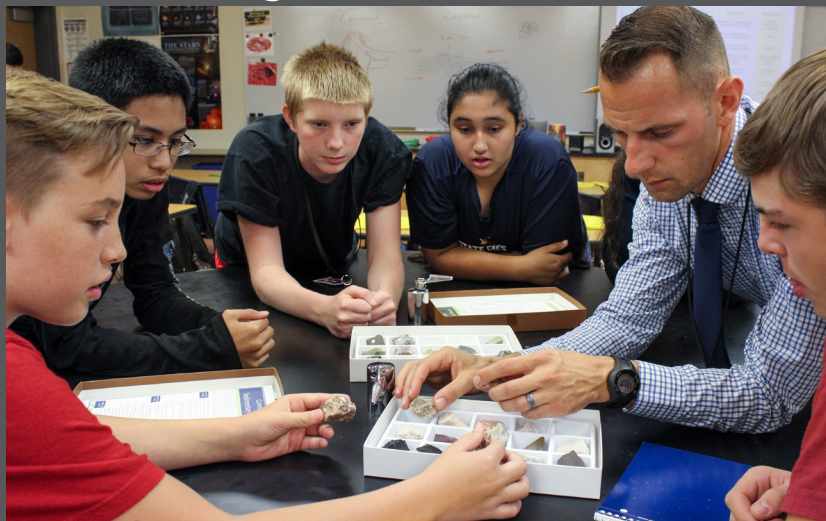
Growing up, I always had a curiosity about the world around me. We did a lot of camping when I was young. This exposed me to the outdoors, wildlife, weather, seasonal patterns, and the northern lights. These were things that I wanted to know more about and sparked my scientific curiosity. While in school, I naturally gravitated toward math and science classes.

## **How have your parents' professions influenced you?**

I think my father's career had the most influence on me. He built custom curve stairs for homes and businesses. In his job he was required to calculate the slope of the staircases, the tangential points that anchored to the wall, the curvature of the staircases, the radius of the interior and exterior of the stairs, and how to do that with straight pieces of wood. He taught me how to solve difficult problems and how to think analytically.

## **What made you decide to become a science teacher through Noyce and MAst?**

Before becoming a teacher, I was a broadcast meteorologist. During



LINDSAY AUGUSTYN | UNL CSMCE

*Tony DeGrand shows his class metamorphic rocks in his geoscience course at North Star.*

that time, I would get requests to give weather talks to elementary, middle, and high school students. I remember feeling really good after talking in front of a classroom about something that I was passionate about. After those talks, I always thought that if I were ever to leave television, I would like to become a teacher. After I found out about the MAst program at UNL, I figured that was my opportunity to make the career transition. With the financial assistance of the Noyce grant, I was able to turn that thought into reality.

## **How has the MAst program prepared you for teaching?**

Without a background in education, I felt like the MAst program did a very good job preparing me for teaching. I liked the fact that classes were geared toward those of us who wanted to teach science. The methods classes were specific to what we were going to be doing in the classroom.

## **Which professional development**

## **opportunities have you taken advantage of from Noyce?**

The experience at the Noyce regional conference at Kennedy Space Center was a unique experience where we were able to become completely immersed in space science. As an Earth and space science teacher, as well as a physical science teacher, I was overjoyed with the chance to spend as much time at the space center as we did. The lessons I learned and the information I received will be a fantastic addition to my curriculum.

## **What are your future goals in your teaching career?**

In the short term, I would like to craft my physical science curriculum to be more inquiry-based. In the future I would like to hold the students more accountable for their learning. Also, I would like to create the curriculum for a high school meteorology course. The class would integrate math, physics, chemistry, and computer science. ■



# Longitudinal study of MAst teachers provides insight

There is little research that identifies how contributing factors interact to produce highly qualified, effective science teachers. Noyce PI Elizabeth Lewis and her research team conducted a longitudinal study of four cohorts of MAst program graduates.

Bianchini (2012) found that little is known about the induction period and recommended that more studies (a) follow beginning science teachers from preservice teacher education into classroom practice, and (b) trace connections, or lack there of, across induction training, beginning teachers' classroom practices, and student learning.

With the Next Generation Science Standards (NGSS Lead States, 2013), it is critical to understand how to educate effective and capable science teachers and identify foci for professional development that can help sustain teacher growth post-teacher education programs.

The Noyce research team investigated the teaching practices of beginning science teachers based on the following research questions:

1. What is the teaching self-efficacy (specifically, in terms of student engagement, classroom management, and instructional strategies) of beginning science teachers?

2. What, if any, changes in inquiry-based teaching practices have occurred over time as science teachers have gained teaching experience?

Teacher Education Program (14 months)	Teaching Induction Phase		
	1st Year	2nd Year	3rd Year
<u>Coursework</u> : Formal and consistent learning of SMK and PK	Informal learning and incidental professional development experiences		
<u>Field experiences</u> : Apprenticeship and practice during supervised practicum and student teaching placements	Informal mentoring on the job, more direct interactions with colleagues, administrators, parents		
Development of teaching self-efficacy over time			

**Figure 2. Research design, foci, and measures**

## Methods

**Teaching Self-efficacy.** Program graduates completed a survey at the end of student teaching, first ( $n = 24$ ), second ( $n = 20$ ), and third ( $n = 8$ ) years of teaching. The *Teacher Sense of Efficacy Scale*, a 24-item survey instrument with a five-point Likert scale (Tschannon-Moran & Hoy, 2001), investigates teacher efficacy in three areas: (a) Student Engagement (SE), (b) Classroom Management (CM), and (c) Instructional Strategies (IS).

**Classroom Practices.** Researchers analyzed 319 science lessons of induction phase teachers from their student teaching placements to their third year after completing the MAst teacher education program (four cohorts from 2012 to 2015).

The dataset included 71 lessons by student teachers ( $n=33$ ), 116 by first- ( $n=26$ ), 95 by second- ( $n=19$ ), and 37 by third-year teachers ( $n=6$ ). Five researchers observed and coded lessons using the EQUIP instrument (Marshall, Horton, Smart, & Llewellyn, 2008) to measure the quality of inquiry-based instruction in middle and high school science classrooms. EQUIP employs a scale of 1 to 4 to describe the degree of inquiry in a lesson. Level 1 corresponds to “pre-inquiry” (a teacher-centered lesson) and 4 to “exemplary inquiry” (an open-ended and engaging student-centered lesson). Frequency counts of “proficient” and “exemplary” inquiry (Levels 3 and 4) were used as a proxy for effective teaching practices.

## Results

**Teaching Self-efficacy.** Researchers examined the teachers' changing self-efficacy using a multivariate analysis of variance (MANOVA). The three outcome variables were the three subscales on the instrument, self-efficacy regarding: (a) student engagement, (b) instructional strategies, and (c) classroom management. The number of years teaching were used to predict change across the multiple outcome measures. It was discovered that time spent teaching accounted for average differences across the three measures.

Over time, it appears as if the MAst teachers who have persisted through the induction period have maintained a generally positive outlook on their own agency (i.e., they can do “some” to “quite a bit” to affect positive change) in these three areas of teaching, even after their first year of teaching. On average, these beginning science teachers appear to think that their actions can result in: increasing student engagement, keeping classrooms running smoothly, and implementing effective instructional strategies. The positive nature and stability of these beginning science teachers' self-efficacy can be attributed to intellectually strong teacher candidates and a rigorous teacher preparation program.

**Enacted Curricular Practices Results.** Researchers made 319 observations of science lessons during multiple years of teaching by beginning science teachers (see Table 3). They used the EQUIP instrument to code these observations of teachers from student teaching to teachers' third year teaching.

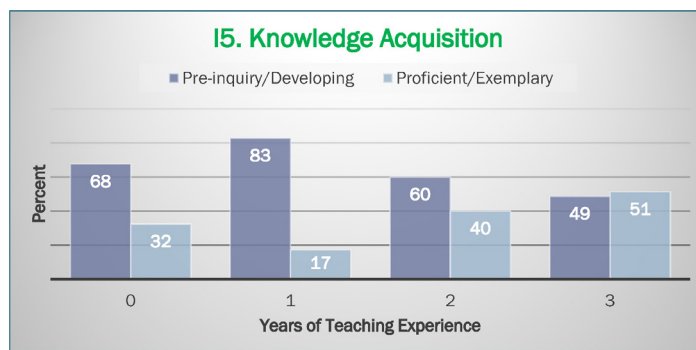
Overall, the areas that appeared to show the greatest growth toward inquiry-based instruction as teachers gained more experience was on the instructional factors and discourse factors scales. Some more modest growth was observed on the curriculum factors scale.

When specific items on the EQUIP were reviewed, there was a clearer pattern of growth and areas of challenge. Researchers selected these representative items to illustrate this. Examples of four areas of steady growth (see charts at right) included: (a) knowledge acquisition, (b) questioning level, (c) conceptual development, and (d) content depth. These areas were strongly addressed during the MAst program.

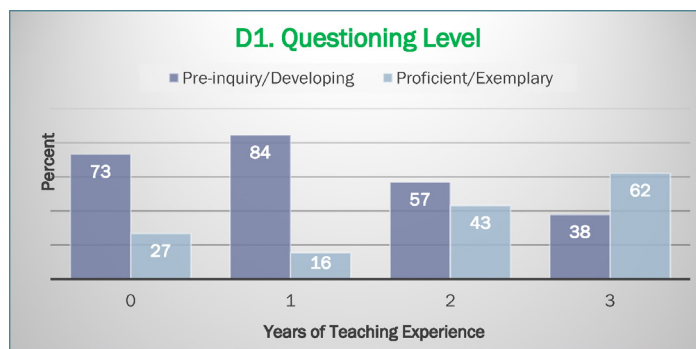
Some areas of challenge (see charts on page 15) included: (a) order of instruction, (b) learner centrality in selected curriculum, (c) classroom interactions, and (d) accessing students' prior knowledge.

While the 5E model of inquiry-based instruction was used to frame science teaching methods courses in the MAst program, ongoing professional development may be needed to support further growth in these

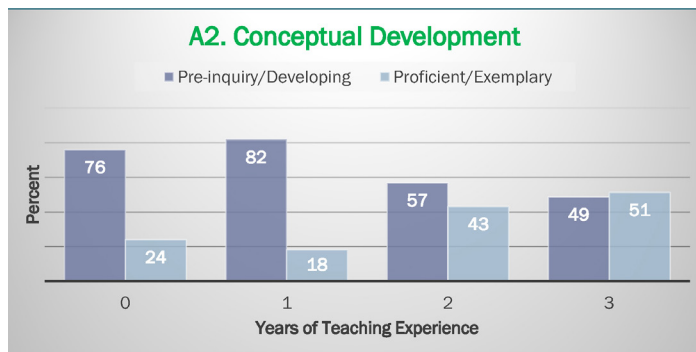
## Most Growth



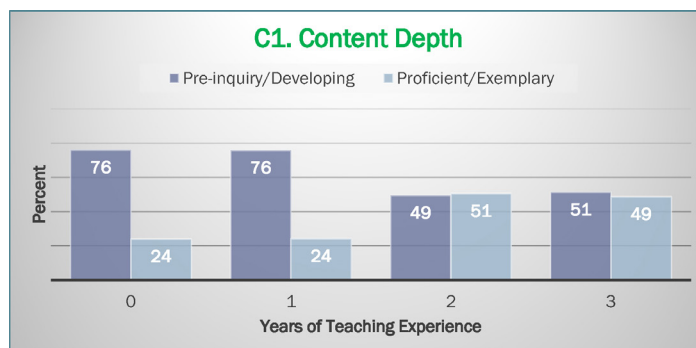
15. Knowledge acquisition refers to student learning that requires application of concepts and processes skills in new situations.



D1. Questioning level refers to the degree to which questioning challenges students' critical thinking.



A2. Conceptual development refers to the degree to which teachers encouraged process-focused learning activities that required critical thinking.



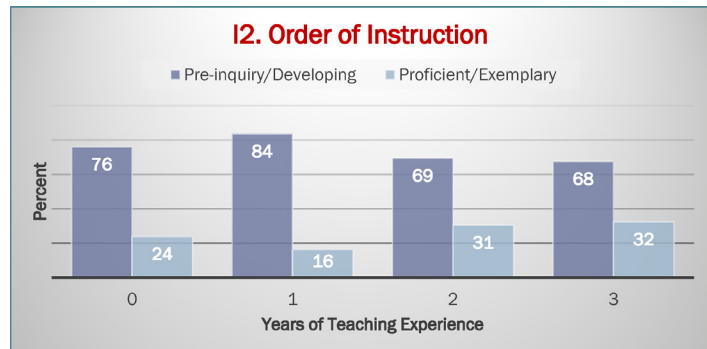
C1. Content depth refers to the degree to which the lesson provided depth of content with significant connections to the big picture.



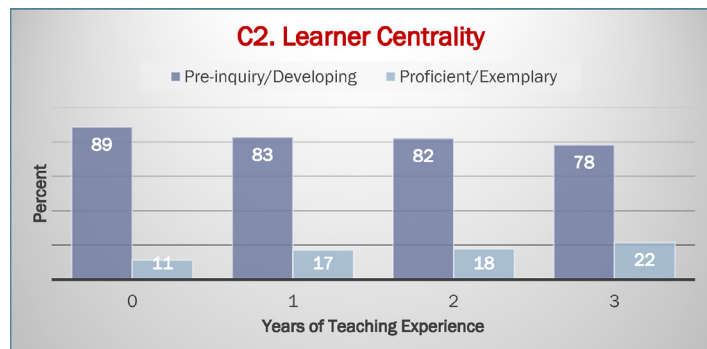
**Table 4. Preliminary Findings in Teachers' Enacted Curricular Practices Measured with EQUIP**

Teaching Phase	Student Teaching	Induction Year 1		Induction Year 2		Induction Year 3	
Time point	Sem 0 (Spring)	Sem 1 (Fall)	Sem 2 (Spr)	Sem 1 (Fall)	Sem 2 (Spr)	Sem 1 (Fall)	Sem 2 (Spr)
# of Lessons	71	38	78	39	56	14	23
# of Teachers	33	22	26	18	19	6	6

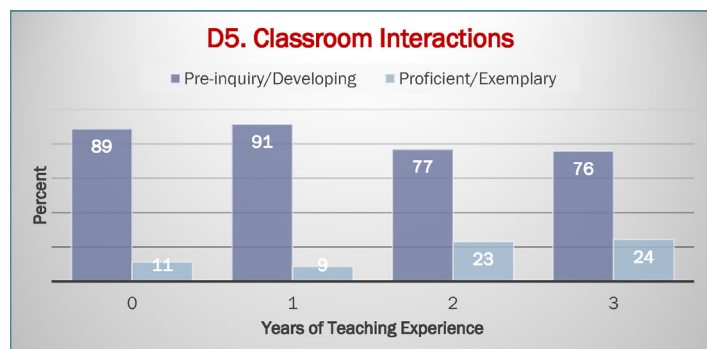
## Most Challenging



*I2. Order of instruction refers to the inquiry-based approach of giving students the opportunity to explore scientific concepts before concepts are fully explained.*



*C2. Learner centrality refers to a science lesson that provided flexibility for students to design and carry out their own investigations.*



*D5. Classroom interactions refers to the students' opportunity to talk with each other.*

beginning science teachers.

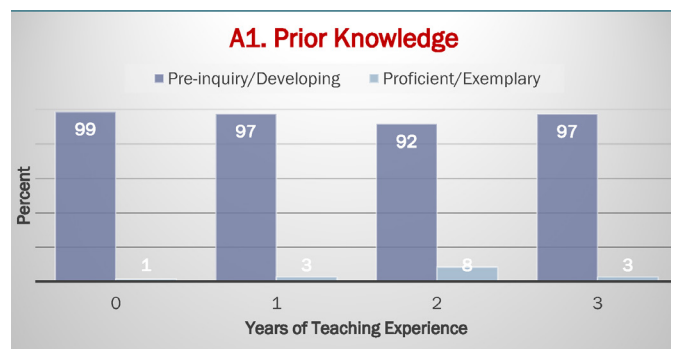
The most persistently lowest scoring aspect, assessment, showed little growth from first to third year teaching. This suggested that a better effort is needed, on the part of teacher education programs, to document these teachers' practices of assessment and/or teachers need more professional development to encourage the use of more standards-aligned, formative, and summative assessment practices.

## Future Research

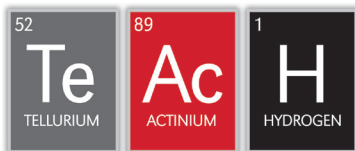
These data will be used along with data from 2015-2016 to build a hierarchical linear model of teacher change. Researchers also are tracking specific instructional strategies across time to determine which ones teachers use most and least frequently. To date the teams has not disaggregated these data by teachers' in-field content status, school level (i.e., middle and high school), or by socioeconomic status, all of which may influence the degree to which inquiry-based instruction may be used by beginning science teachers.

UNL's new Noyce grant (Track I, Phase II) is funding a comparison study of teachers who graduated from UNL's undergraduate program. The research team will be investigating if, by comparison, the MAsT program accelerates new science teachers' growth. This will allow them to provide more specific recommendations to teacher education programs and improve all science teacher preparation efforts. ■

*Report produced by Elizabeth Lewis, Ana Rivero, Aaron Musson, Jia Lu and Lyrica Lucas of UNL.*



*A1. Prior knowledge refers to the teacher's practice of accessing student's prior knowledge before beginning a new topic.*



# Professional development combats feelings of isolation

One component of a strong teacher preparation program is related to building a cohort or community of practice among students (Wenger, 1998). Dinsmore and Wenger (2006) indicated that the participants in their study of preservice teachers saw the power of building relationships within their cohorts and these relationships developed by preservice teachers influenced their own learning and the learning of their cohort.

As part of the MAst community of practice, students engage in pedagogical inquiry that links their integrated methods and field experiences to problematizing practice and studying those problems. Building on their pedagogical inquiry experiences, students remain as a community engaged in developing connections from their teacher preparation into their first year as a teacher.

A New Teacher Network also supported the MAst teachers and linked their theoretical understanding as teachers to practice through mentorship and coaching (Blachowicz, Obrochta, & Fogelberg, 2005; West & Staub, 2003).

Support is a key element for success in teachers (Liston, Whitcomb, & Borko, 2006) and



COURTESY PHOTO

(From left) Cohort 5's Sara Al-Shdifat, Alia Aljamaal, Peter Stone, and Blair Kalinski attend the NSTA regional meeting in Kansas City in December 2015.

there is ample evidence to show that too many teachers feel isolated and leave the profession because they lack support. This is true for new teachers, especially in rural communities, who report professional isolation (Pendarvis, 2005) and indicate there are many challenges for which their undergraduate teacher education did not prepare them (Davis, Petish, & Smithey, 2006).

The challenge facing school districts and universities that educate teachers is how to retain new teachers and help them begin their journey from being a well-educated beginning teacher to

becoming a highly effective teacher committed to the profession.

Professional development opportunities are offered to MAst PSTs, such as the annual Nebraska Association of Teachers of Science conference and regional and national Noyce conferences. Once the teachers graduate and become in-service teachers in their early years, they still receive either site visits (or videotape their teaching) from

the research team to receive feedback. The graduates welcome these meetings and the feedback on their praxis, as this keeps them connected to the program and helps them not to feel isolated and overwhelmed in their first years of teaching. They are still welcome to contact their faculty mentor, student teacher supervisor, cooperating teacher or cohort peers for support in their teaching.

However, the need for more professional development opportunities continues and can make a major impact on teacher retention. ■



# MAst teacher graduates

**2016-17 Teaching Positions**  
(School and district in Nebraska unless otherwise noted)

## Cohort 1 (2011-12)

### Andrew Benker

Benson High School,  
Omaha Public Schools:

*“What excites me most about teaching science is the time I get to spend with students as they really stop to look at the world around them. That puzzled look when they realize something does not work like they thought, and the look of joy when they finally find a better explanation. Every time I see a student go through that I remember how amazing the natural world really is.”*



### Randy Crnkovich

Mount Michael  
Benedictine, Elkhorn:

*“I teach my students that in order to understand biology, you have to understand and appreciate evolution. They get to see the world in a new way, and that is powerful. I constantly study and learn to keep up with what is new in the field, and that is very personally rewarding.”*



### Maggie Day

### Caitlin Falcone

Lourdes Central  
Catholic, Nebraska  
City:

*“I love seeing students get excited about learning science and mastering the subject!”*



### Luciano Insua

Lincoln East High School, Lincoln  
Public Schools

### Mia Manakul

Lincoln Preparatory Academy,  
Kansas City, Missouri

### Cassie Manhart

Beatrice High School, Beatrice

Public Schools: *“As a science teacher, I am most excited to see students engaged in learning – when they are collecting data and doing real science.”*



### Kelsey (Kumm) Nodgaard

Millard West High School, Millard  
Public Schools

### Lanae Pierson

Columbus High  
School, Columbus  
Public Schools:

*“I love hearing students’ questions. Sometimes we get off topic, and I’m OK with that because I know they’re curious about the world around them and*



*are asking questions, which can get them into a more inquiry-driven state of mind. This state of mind can help them in all areas of their lives.”*

### David Primavera\*

Prep Academy, Scottsdale, Arizona

### Kate Sackett-Koll

Central Middle School, Millard  
Public Schools

### Nate Van Meter

Louisville Middle  
School, Louisville

Public Schools: *“The thing that continues to excite me about teaching science is the opportunity to share my passion for learning about the world around us with the kids in my classroom. I enjoy the challenge of finding ways to engage kids in the process of asking questions and collecting data to help them answer those questions.”*



### Leah Zohner

Millard North High  
School, Millard Public  
Schools:

*“I am most excited about having debates, discussions, and doing labs with students. The more involved the kids are, the better.”*



Continued on page 18

## Cohort 2 (2012-13)

### Heath Anderson

Plainview Public Schools

### Kristoff Berzins\*

Central High School, Omaha Public Schools

### Vicky Boone

Johnson County Central High School, Tecumseh: *"My goal is to give these students a good foundation so that they are well prepared for college and for life in general. I am really looking forward to the new school year, seeing 'my kids' again, and having the opportunity to help them experience the subjects I enjoy the most. I am so grateful to the MAsT Program and the Noyce Scholarship for making this such an easy transition from one career to the next."*



### Emily Brown

Middle School Zoo Academy, King Science and Technology Magnet Middle School, Omaha Public Schools: *"I am most excited about teaching science, especially in the Zoo Academy, because of the wonder and excitement that I get to experience through my students. I am truly thrilled to be able to help guide these young students and show them that science is important to everyday life. I also get excited about being able to provide authentic science opportunities for my students through citizen science projects and problem-based learning."*



### Ayla Duba

Lincoln Southwest High School, Lincoln Public Schools

### Kim (Miller) Helzer

Centennial High School, Utica

### Sara Laimans\*

The Academy, Westminster, Colorado

### Matt Koziol

Northridge High School, Greeley, Colorado: *"My favorite part of teaching science is changing the minds of students who enter my classroom with the mindset of 'I hate science' or 'I'm so bad at science.' The attitude I bring to every new year as a teacher is 'We'll see.' That transformation of a student's mindset is a large part of why I am a science teacher."*

### Patrick Mumm

Harvard Public High School

### Kate Okerlund

Lincoln Southeast High School, Lincoln Public Schools

### Michael O'Neal\*

Higley High School, Gilbert, Arizona

### Spencer Powell

Bookcliff Middle School, Grand Junction, Colorado: *"Over the last three years I've been developing a unit on human evolution called 'What makes us human?' I am excited to continue to build and improve this unit, which I feel my students find very engaging and memorable."*



### Chrissy Ritta

Bellevue West High School, Bellevue Public Schools

### Katie Schueth

Johnson Crossing Academic Center, Fremont

### Suzie Wilson

Broken Bow High School, Broken Bow

## Cohort 3 (2013-14)

### Nikki Binderup

Lincoln Northeast High School, Lincoln Public Schools

### Kay Burbach

Lincoln Southwest High School, Lincoln Public Schools: *"Science helps people understand the world around them. The world is ever changing and our society needs critical populations to guide our future. I get most excited about revealing phenomena around our world and hope that they use the information to make informed decisions in our future."*

### Melissa Crabb

Millard West High School, Millard Public Schools

### Eric Hanson

Lincoln Southeast High School, Lincoln Public Schools

### Steve Jacobsen

### Cory Johnson

### Samantha (Davis) Lowery

Lincoln Southeast High School, Lincoln Public Schools

### Taylor Montgomery

Grand Island High School, Grand Island Public Schools: *"I get most excited teaching science when I see it spark imagination and curiosity in my students. Science is our future, and finding a way to get our youth involved will be very beneficial."*



### Brett Moser

Gering Public Schools

## Katherine (Byers) Sporcic

Norris Middle School, Omaha Public Schools

## Joshua Trujillo

Hough High School, Charlotte-Meckleburg, North Carolina

## Cohort 4 (2014-15)

### Mary Beth Bavitz

### Tony DeGrand

Lincoln North Star High School, Lincoln Public Schools: *"My passion for teaching science was the next logical step after working as a broadcast meteorologist. I have always had an interest in science. That is what motivated me to study atmospheric science in college and pursue a career in the science field. I realized that my true passion was to share my interest in science with high school students and hopefully inspire them to also pursue a future in a science field."*



### LaTravia Dobson

Boone Central High School, Albion

### Victoria Freeman

Lincoln East High School, Lincoln Public Schools

### Jean Johnson

### Tiara Kush

Elkhorn High School, Elkhorn Public Schools: *"I enjoy helping students connect science courses to current events and things that are personally relevant to them in their daily lives or futures."*



## Travis Ray

Career Academy, Lincoln Public Schools: *"I enjoy teaching students how to think critically. Seeing students develop high-level thinking skills, which I know will serve them well in their future career, gives me great joy."*



### Michael Schroeder

Wood River High School

### Miki Valenta

### Ethan van Winkle

Lincoln Southeast High School, Lincoln Public Schools: *"We all have misconceptions about how the world works and it can be very humbling to have those be torn down. Science is an excellent gateway to actively achieving critical thinking and the pursuit of evolving knowledge. With these newfound tools and knowledge, my students will walk out of my classroom seeing the world differently."*



### Kristin Wiedel

Blue Valley West, Kansas: *"I love being able to help and support students in their exploration of the world around them. Teaching chemistry and biology is such a joy because students can develop a deeper understanding of the world they live in and explain the reasons that things are the way they are."*



## Cohort 5 (2015-16)

### Sara Al-shdifat

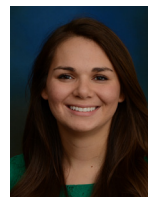
Omaha North High School, Omaha Public Schools: *"Building the relationships, learning from my students and most importantly having fun teaching a subject I love!"*



### Alia Aljamal

### Blair Kalinski

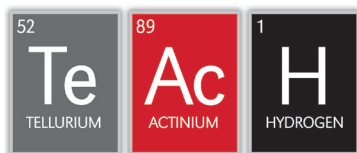
McMillan Magnet Middle School, Omaha Public Schools: *"I am excited about many things, but I am most excited about getting to know my students, their needs as learners, and also as individuals in order to create a supportive classroom community. Additionally, I am excited about planning and implementing curriculum that I haven't had the opportunity to teach yet, and getting to know my co-workers."*



### Peter Stone

Lincoln Southwest High School, Lincoln Public Schools

\* = Completed MAst without the benefit of a Noyce stipend



*The 22 teachers in this 2016 reunion photo represent LPS, OPS and many other school districts in Nebraska. One teacher is teaching in Colorado. A few are still preservice teachers who just finished their student teaching in LPS.*

COURTESY PHOTO

## Graduates attend reunion, PD day

Nebraska teachers who have graduated from the MAst program in the Department of Teaching, Learning and Teacher Education gathered for a reunion of sorts on May 14, 2016, in Henzlik Hall. They spent their Saturday in a professional development day to address their teaching needs.

“The MAst teacher alumni enjoyed seeing former classmates and sharing their emerging expertise in teaching science with each other,” said Elizabeth Lewis, associate professor and MAst program coordinator. “They appreciated learning some ways to revise and enhance their curriculum and are looking forward to applying some new ideas to their teaching.”

The teachers came from Lincoln Public Schools (LPS), Omaha Public

Schools (OPS) and many other districts in Nebraska. One even came from a district in Colorado. A few MAst program students who recently completed their student teaching in LPS joined them.

The MAst graduates attended sessions on using technology in their science classrooms, how to provide students with feedback on their work, how to work effectively with special education co-teachers and how to organize field trips and apply for grants. There was also a discipline-based lesson sharing session in which teachers recommended effective science activities to each other. According to Lewis, the science teachers also benefited from networking with each other before, during, and after the individual professional development sessions.

The majority of teachers participating were supported by a National Science Foundation Noyce grant stipend during their MAst program (from 2011-2016) and most are teaching in high-needs school districts.

The planning committee was composed of Lewis and one person from each of the five MAst cohorts: Nate Van Meter, Cohort 1, Louisville Public Schools; Kristoff Berzins, Cohort 2, OPS; Kay Burbach, Cohort 3, LPS; Ethan Van Winkle, Cohort 4, LPS; and Blair Kalinski, Cohort 5, OPS. The planning committee also generated the topics for the workshop sessions.

For more information on the MAst program, please visit <http://go.unl.edu/mast516>.



# MAst instructors

Many thanks to the following dedicated course instructors who have contributed to the success of the MAst program.

## TEAC 851V Science Teaching Methods I

Jim Rynearson (2011-2013)  
Aaron Musson (2014 & 2015)  
Ana Rivero (2015 & 2016)  
Amy Tankersley (2016)

## TEAC 852V Science Teaching Methods II

Elizabeth Lewis (2011-2015)  
Aaron Musson (2016)

## TEAC 861 Education for a Pluralistic Society

John Raible (2011-2016)

## TEAC 813M Teaching ELLs in the Content Areas

Ted Hamann (2011)  
Jenelle Reeves (2012)  
Janet Eckerson (2013 & 2014)  
Brandy Judkins (2015 & 2016)

## SPED 801B Special Education for Teachers

Miki Charf (2011-2015)  
Suzanne Kemp (2016)

## EDPS 851/991 Adolescent Development

Douglas Kauffman (2011 & 2012)  
Mary Zeleny (2015-2016)

## TEAC 841 Reading in the Content Areas

Sarah Thomas (2013-2016)

## TEAC842E History & Nature of Science (Discontinued)

Jon Pedersen (2011)  
Krista Adams (2012)

## TEAC 880A Instructional Technology

Lynne Herr (2012-2016)

## TEAC 800 Inquiry into Teaching

Elizabeth Lewis (2011, 2012 & 2015)  
Wendy Smith (2013)  
Guy Trainin (2014)  
Steve Swidler (2016)

## TEAC 801 Curriculum Inquiry Seminar

Krista Adams (2012)  
Peggy Tilgner (2013)  
Thomas McGowan (2014 & 2015)  
Tricia Gray (2016)

## TEAC 889 Masters Seminar Capstone Projects (Academic Advisors)

Elizabeth Lewis (2011-2015)  
Jon Pedersen (2011-2013)  
Peggy Tilgner (2011-2013)  
Julie Thomas (2014-2015)  
Larry Scharmann (2016-2017)

## Practicum & Student Teaching Supervisors

Jon Pedersen, Jim Rynearson, Robert Curtright, Elizabeth Lewis, Aaron Musson, Lyrica Lucas, Ana Rivero, Amy Tankersley

## TEAC 803B Student Teaching Seminar

Jon Pedersen (2012)  
Elizabeth Lewis (2012 & 2013)  
Sara LeRoy-Toren (2014-2016)

## OTHER PROGRAM CONTRIBUTORS

### UNL Office of Field Placements

David Van Horn, Director 2011-2014  
Sara Skretta, Director 2014-2016

### Cooperating Science Teachers

Charlie Bittle, James Blake, Gary Brown, Malinda Burk, Dan Carpenter, Tracie Chapo, Jackie Clifford, Greg Cooper, Randy Emry, Megan Euler, Shelly Fargo, Susan Frack, Michael Geist, Genee Handley, Darla Haugerud, Jodie Jantz, Cindy Karel, Eugene Kirianov, Karl Lautenschlager, Wallace Mason, Erin Miles, Carol Moravec, Burke Morrow, Brad Niimi, Bryan Penas, Tracy Rumbaugh, Josh Schlautman, Marcus Schmidt, Kevin Schrad, Daniel Shafer, Mark Shearer, Michelle Sjuts, John Snoozy, Kim Stoebner, Kyle Thompson, Jason Thomsen, Tracey Weise

### LPS K-12 Science Curriculum Directors

Kirsten Smith (2009-2014)  
James Blake (2014-2016)

## Tribute

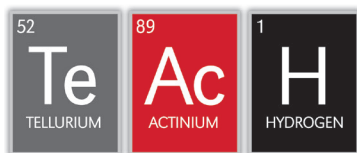
### Jim Rynearson



Jim Rynearson

Jim Rynearson was a master science teacher in the Department of Teaching, Learning and Teacher Education supported by

a UNL Program of Excellence (POE) Grant. Prior to joining UNL, Jim was a recently retired science teacher who taught at Lincoln High School. In the MAst program Jim taught science teaching methods courses and oversaw practicum and student teaching placements. He was instrumental in the development and establishment of the UNL New Teacher Network (NTN) program, which was created to help new science teachers successfully transition to their first classrooms, and, more importantly, persist in their chosen career path. Jim was an active member and leader in the Nebraska Association of Teachers of Science (NATS) and loved teaching science and mentoring other science teachers. The Nebraska science education community was greatly saddened with Jim's passing in the spring of 2015, but his enthusiasm for science and teaching lives on through all those who had the pleasure of working with him. Thanks to Jim for being a 'difference maker' in the lives of so many teachers and students.



# Project team

## NOYCE PRINCIPAL INVESTIGATORS

**Dr. Elizabeth Lewis**, PI from 2012-2016 (co-PI 2010-2012), is an associate professor of science education in the University of Nebraska-Lincoln's (UNL) Department of Teaching, Learning and Teacher Education (TLTE). A former ninth-grade Earth and space science teacher and National Board Certified science teacher, Lewis coordinated the UNL MAst program since its first cohort began in 2011 and has advised half of the 60 Noyce recipients in their MA programs.



**Dr. Daniel Claes**, co-PI, is Professor and Chair of the UNL Department of Physics and Astronomy. Claes, a former high school mathematics and physics instructor, is a high-energy physicist. As co-PI on the Noyce grant, he reviews stipend applications for incoming MAst students. Claes served on faculty panels for many of the MAst students' capstone projects.



**Dr. Tiffany Heng-Moss**, co-PI, is a professor in UNL's Department of Entomology and associate dean of the College of Agricultural Sciences and Natural Resources. Her expertise includes developing interdisciplinary education projects and educational programs for undergraduate and graduate students and K-12 educators and students. As co-PI on the Noyce grant, she reviews stipend applications for incoming MAst students. Heng-Moss served on faculty panels for many of the MAst students' capstone projects.



**Dr. Jon Pedersen**, co-PI from 2012-2015 (original PI from 2010-2012), professor of science education, was the associate dean for research in UNL's College of Education and Human Sciences (July 2011-June 2016). Pedersen co-coordinated the MAst program with Lewis for the first MAst cohort (2011-2012) and advised students in the first two cohorts.



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COVER PHOTO: TONY DEGRAND'S CLASSROOM  
AT LINCOLN NORTH STAR HIGH SCHOOL  
BY LINDSAY AUGUSTYN



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*At the 2016 Midwest Noyce Conference at Kennedy Space Center, NASA astronaut Dr. Sam Durrance (third from right) gave the keynote address. UNL's Noyce and MAst teachers (from left) Nate Van Meter, Tony DeGrand, Andrew Benker, Associate Professor Elizabeth Lewis, Ethan Van Winkle and Spencer Powell were in attendance.*

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