

Dear Minnesota Senators and Representatives,

I had the pleasure of learning Earth and Space Science from a licensed Earth and Space Science teacher. Earth and Space Science, through its concrete and immersive nature, has the potential to engage students that traditionally do not participate with STEM. The world is changing. Climate change has increased environmental hazards such as drought, wildfires, and massive storms. Humanity is returning to the moon. Energy, water, and land managers face tough decisions. A licensed Earth and Space Science teacher is best situated to engage and teach students about these topics and set them upon career paths that can help solve society's problems. My licensed Earth and Space Science teacher put me on the path to a PhD in geology. Because of that initial engagement, I have applied my geological skills in several fields. As an environmental consultant, I helped to identify and remove environmental pollutants. As a geologist, I helped to develop energy resources. As a policy intern in Washington, D.C., I developed outreach resources. As an educator, I taught students to develop and engage critical thinking and integration skills. The path to all of these professions began in high school with an Earth and Space Science class.

Please commit to supporting students and preparing them for a dynamic world by funding Earth and Space Science professional development for teachers. Professional development will enable teachers to achieve licensure in Earth and Space Science and empower schools to meet the updated 2019 Minnesota Science Standards. I also urge you to help clarify these standards by requiring one credit of Earth and Space Science in high school. The standards currently require Earth and Space Science to be taught but do not require an Earth and Space Science course. Thank you for your commitment to student's education and enabling them to critically engage with their world and begin career paths that solve society's problems.

Sincerely,

Jeremiah Bernau  
Geology PhD student



## Minnesota Ground Water Association

10/23/2020

Dear Members of the Education Committee,

I am writing today on behalf of the Minnesota Groundwater Association to support an initiative to improve the quality and quantity of earth science education in Minnesota schools.

The Minnesota Groundwater Association supports amending the Minnesota high school graduation requirements to require one credit of a dedicated earth and space science course taught by a licensed ESS teacher, and to secure funding for both the 6th grade and high school ESTEM training programs for three years as a legislative budget item.

All Minnesota students need a foundational understanding of earth processes so future generations of Minnesotans can become leaders in geoscience-based industries, conservation, sustainable farming, water quality, engineering and other areas integral to Minnesota's (and the planet's) continued prosperity. Quality earth and space science education is good for all Minnesotans and Minnesota businesses. In order to teach this course effectively, the state needs to support professional development for science teachers who may not have taught this material before. Earth Science Teacher Education Matters (ESTEM) is a teacher professional development program specific to Minnesota, designed to train 6th grade teachers in their new, grade-level earth science subject matter and help current high school science teachers, especially in rural areas, obtain affordable additional ESS licensure. ESTEM will provide regional, cohort-based learning groups facilitated by Minnesota teachers and professors as well as needed online courses. Our ESTEM planning team has everything ready to begin professional development cohorts during the summer of 2021.

Please commit to strengthening Minnesota's graduation standards and professional development for science teachers by focusing on earth and space science courses.

Signed,

A handwritten signature in black ink, appearing to read "Anthony C. Runkel".

Anthony C. Runkel  
President-elect, Minnesota Groundwater Association



# Amherst College

12/03/2020

To the members of the MN State Legislature;

I am writing, first and foremost, to express my excitement that earth science is being adopted in high school curricula across the state! I am a graduate of Minnesota Public Schools (Moorhead High School, class of 2007), and thanks to a supportive middle school earth science teacher and a passion for STEM, I pursued a career in earth science myself. My work has taken me to the ends of the Earth, and through my role on the scientific advisory board for NASA's ICESat-2 mission, to space, to look back at our planet and watch it change beneath us. I have loved every second of my journey from Moorhead, MN.

Now, working with students of my own, I see the role earth science can play in bringing students into STEM. The next generation is intensely socially engaged – they want to do good in the world, and coursework in pure chemistry, physics, and math, can seem removed from real world problems. But when applying those same concepts to climate dynamics, natural hazards, environmental protection, you can see their eyes light up. Earth science can be an on-ramp that catches the most unsuspecting students, helping them to find their place in science and creating a diverse set of problem solvers that bring their insights and ingenuity to problems across a range of disciplines.

Earth science, however, suffers from a generation of academic mistreatment that still lingers in the minds of some educators – the idea that geology was “rocks for jocks”, a course in vocabulary rather than process, one that has no practical value. This is simply not true; the Earth and climate system controls the clothes we wear, the way we build our homes and businesses, the crops we grow, the industries of our state, and much much more. For earth science classes to be effective, high school teachers need to see the depth of the discipline, and bring the contagious enthusiasm required in every great class.

While I still brag about my experience in Moorhead Public Schools, it really came down to the engagement of my teachers. It is worth investing in the teacher experience as you build up a new earth science curriculum, so they can pass that investment on to the students. Their knowledge can't just come from a textbook – the more you can do to help the teachers develop as earth science educators, the more students will come out of Minnesota Public Schools with stories like mine.

I'm excited to see the next generation of earth science problem solvers represent Minnesota to the world,

A handwritten signature in black ink that reads "Nick Holschuh". The signature is fluid and cursive, with a long horizontal stroke at the end.

Nick Holschuh  
Moorhead High School Alumnus, 2007  
Assistant Professor of Geology  
Amherst College, Amherst, MA