What Will Deaf STEM Education Look Like in 2036?

Closing Keynote

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If We Are Preparing Students for 2036, What Should We Build Today?

- What will change in STEM education?
- What must never change?
- What do Deaf students need today to thrive in tomorrow’s STEM careers?

2036 Starts With 2026

We cannot wait for the future to arrive.

- Build language-rich STEM classrooms now.
- Develop the ASL vocabulary and concept for students now.
- Create opportunities for Deaf students to see themselves as scientists, engineers, mathematicians, and technologists.

Al Paul

A Journey of Deaf Education Leadership

IDENTITY & ROOTS
Cleveland, OH; St. Rita's Graduate;
Gallaudet ('03) & MSSE ('05); Seattle Univ.

CREDENTIALS
WA Teaching Cert: Math, Deaf Ed, ASL, & SpEd

EXPERIENCE
19 Years in WA state;
22 Years total teaching K to College

COMMUNITY
20 Years Mentoring; Several non-profit orgs.

CURRENT ROLE
Current: ASL Dual Language K-2



1986….1996….2006….2016

1986: The Mainstreaming Boom

A Shift Toward Total Communication and a Bicultural-Bilingual Foundation

- **Media and Deaf Advocacy:** Captioning and Deaf representation in media, including *Deaf Mosaic* on PBS and coverage of the Deaf President Now! movement.
- **Mainstreamed Math Classroom:** As the only Deaf student in a mainstream math class, I learned through sign language interpreting, overhead projectors, and written mathematical formulas such as PEMDAS.
- **Memorization and Learning:** Memorized information such as Ohio's 88 counties, reflecting my classroom learning experiences.
- **Beyond the Classroom:** Became the top chess player in my middle school for three consecutive years.



Cleveland Plain Dealer

1996: A Turning Point in My Education

- **A Future Decided for Me:** During my IEP meeting, my Teacher of the Deaf (TOD) identified becoming a car mechanic as my transition goal, shaping expectations for my future career.
- **Transferring to a Deaf School:** Moving from mainstream education to St. Rita School for the Deaf changed my educational journey.
- **The Power of Deaf Role Models:** Seeing Deaf role models at St. Rita's transformed my life, expanded my sense of possibility, and helped me envision a different future.
- **Basic Literacy:** basic English reading and writing and language acquisition

2006: From Learning Math Signs to Building STEM Access

- **Learning from Deaf Educators:** Learned mathematics signs from my Deaf math educators, whose knowledge and language shaped my educational journey.
- **Research and Innovation:** Began my master's thesis on mathematics signs, contributing to the development of accessible STEM language.
- **From Student to Educator:** I depended on the teachers who taught me sign language and mathematics. Today, our students depend on me—and on YOU—to provide the language, knowledge, and opportunities they need to succeed.
- **Building STEM Resources:** Contributed to the vision of a STEM dictionary connected to NTID's Science Signs Lexicon.
- **Expanding Opportunities:** Create more opportunities for Deaf secondary students through academic competitions, enrichment programs, and summer experiences, including Gallaudet's Academic Bowl and Battle of the Books, NTID's mathematics competitions and TechTigers, literary competitions, and STEM summer camps.

2016: Advancing Language Access in Deaf STEM Education

- **The Achievement Challenge:** Marschark and Knoors (2012) highlighted persistent challenges in mathematics and science achievement among Deaf students IE: STEM teachers lack specialized training
- **Academic ASL in STEM:** Limited access to academic ASL and specialized STEM vocabulary created barriers to understanding complex concepts.
- **My Contribution:** Provided mathematics-sign workshops, mentored interpreters in STEM, being a Signer for XtraMath and taught mathematics from K–12 through college.
- **Growth of STEM Sign Resources:** An expansion of video-based STEM sign lexicons and educational resources, including ASLCore, ASL-STEM at the University of Washington, Texas mathematics videos, and ASL Clear (now ASL Education Center).
- **Professional Learning:** Science and Mathematics Conference at NTID
- **Expanding My Professional Role:** Became a Certified Deaf Interpreter (CDI), strengthening my commitment to language access and communication in educational settings.

2026: Still Teaching, Still Building, Still Inspiring

- **The AI Era:** Exploring how artificial intelligence can support accessible, personalized, and interactive STEM learning.
- **The COVID Generation:** Addressing the lasting effects of disrupted learning and language access while rebuilding strong STEM foundations.
- **Expanding Career Opportunities:** Creating pathways for Deaf STEM professionals to thrive as scientists, engineers, mathematicians, technologists, and innovators.
- **Social Media and Deaf STEM Visibility:** Learning from platforms and organizations such as Atomic Hands, Seek the World, The Daily Moth, and 85 That!
- **STEM Signs Go Global:** Connecting Deaf communities worldwide through initiatives such as STEM Methodologies in Sign Language (STEMSiL).
- **The Power of Visual Learning:** Research to leverage visual learning, demonstrations, models, and hands-on experiences to make complex STEM concepts accessible and meaningful for Deaf students. IE: Gallaudet University's Visual Language and Visual Learning (VL2)
- **Visual Vernacular (VV):** Harnessing the expressive power of sign language, movement, classifiers, and spatial storytelling to communicate scientific processes and abstract concepts.

Build the future of STEM education today.

We cannot predict every technology students will use in 2036. However, we can prepare them with strong language foundations, mathematical reasoning, curiosity, real-world knowledge, and the confidence to solve problems.

For Deaf students, that future must also include full access to language, high-quality instruction, Deaf role models, and opportunities to participate as creators of knowledge—not merely consumers of technology.

AI Will Change How We Learn

- AI tutors and adaptive learning
- AI-generated visual explanations
- ASL avatars and accessible interfaces
- Personalized practice and feedback



ASL + Future Accessibility

- **AI-Powered ASL Avatars:** Develop accurate, natural, and culturally responsive ASL avatars for educational platforms
- **Visual and Spatial STEM Learning:** Use ASL, spatial representations, and visual explanations to communicate complex STEM concepts.
- **Immersive Digital Experiences:** Provide accessible simulations and virtual laboratories that allow Deaf students to explore, experiment, and solve problems.
- **Real-Time Accessibility:** Integrate live captioning and visual communication tools to support inclusive learning environments.
  IE: Microsoft Teams: sign language mode
- **Deaf-Led Innovation:** Ensure Deaf people are involved in designing, developing, and evaluating technology—not just using it.

The STEM Language We Build Today

- **Continue developing STEM signs** to keep pace with new and emerging terminology, such as iPhone Duo, and AI.
- **Teach complex concepts,** not just vocabulary, to build deeper understanding.
- **Connect signs to visual explanations,** including diagrams, models, movement, and real-world experiences.
- **Document and share emerging STEM language** to support consistency and collaboration.
- **Engage students through technology and hands-on activities** that spark curiosity, encourage exploration, and make learning meaningful.

Real-World STEM and Everyday Experiences

- **Connect STEM to everyday experiences** that help students apply knowledge to real-life situations.
- **Explore practical problems:** Is an egg raw, hard-boiled, or spoiled? How do you check tire pressure or change a tire? What is a mortgage? How do you test a smoke or carbon monoxide (CO) detector? How do you read an analog clock?
- **Explore emerging technology:** Use real-time captioning glasses or speech-to-text apps to support access to STEM information.
- **Bring STEM concepts to life with VR and AR:** Explore human anatomy, chemistry experiments, space, engineering systems, and laboratories through immersive 3D experiences.
- **Build curiosity and critical thinking:** Give students real-world problems that require asking questions, gathering evidence, testing ideas, and developing solutions.

Teachers Must Become Future Builders: From Memorization to Critical Thinking

- **Teach students** how to ask questions and how to learn, not just what to know.
- **Embrace AI and emerging technologies** while teaching students to evaluate information critically, recognize AI limitations, and use AI responsibly.
- **Collaborate across disciplines by connecting** Deaf education, STEM, interpreting, and technology.
- **Keep ASL and Deaf culture c**entral to innovation, ensuring Deaf people help shape and create future technologies.
- **Expand professional learning and certification opportunities** in STEM education and ASL to strengthen teaching practices and accessibility.
- **Prioritize hands-on learning** through experiments, demonstrations, building, and real-world problem-solving.
- **Explore AI film generators** to help students create visual stories, explain STEM concepts, and bring their ideas to life.

Honoring Deaf STEM Leaders and Inspiring the Next Generation

- **Honor the legacy** of Patrick Sweeney, Dr. James Nickerson, and Dr. Harry Lang by continuing to advance Deaf STEM education.
- **Make Deaf STEM role models visible:** Students need to see Deaf scientists, engineers, mathematicians, programmers, technicians, and innovators.
- **Build mentoring relationships** early to encourage students to explore their interests, develop confidence, and envision their futures.
- **Bring Deaf STEM professionals into classrooms** to share their experiences, expertise, and career journeys.
- **Make career possibilities real,** not abstract by connecting students with Deaf professionals, hands-on experiences, and meaningful STEM career pathways.

What Should We Build by 2036?

- ASL-rich STEM curricula
- Deaf-designed accessibility technology
- Stronger STEM vocabulary in ASL
- More Deaf STEM mentors and professionals
- Deaf-centered learning spaces
- Clear pathways from K–12 to college, technical education, and STEM careers

Start Building the Future Today

- **Ask yourself:** What is one thing you can change in your classroom, program, or school this year?
- The future is not something we predict.
  It is something we build.
- Don't wait for 2036. The future of Deaf STEM education starts with the decisions we make today.
- Build the future your students deserve. Empower Deaf students to question, explore, innovate, and lead.

The future of Deaf STEM education starts with us—today.

Deaf STEM education in 2036 will be more visual, immersive, AI-assisted, and connected to Deaf professionals, empowering students to explore, innovate, and shape the future.

Thank you! Safe travels!

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