

# Revisiting Grand Challenges in SC STEM Education with Rural Communities

## WHO WE ARE

### A Brief History

[South Carolina's Coalition for Mathematics & Science](#) (SCCMS) is an alliance of partnering organizations and initiatives working together everywhere that STEM matters in our state. Together, we address STEM education challenges through partnerships, advocacy and public engagement.

The Coalition was formalized in 2004, with the guidance of BMW Manufacturing Co., Duke Energy (formerly Carolina Power & Light), DuPont, Michelin North America, and the SC Department of Education and a planning grant funded by the National Alliance of State Science and Mathematics Coalitions (NASSMC), the National Aeronautics and Space Administration (NASA), and the US Department of Education. Its precursors, South Carolina's Coalition for Science and Math Education and SC Leadership and Assistance for Science Education Reform, provided a solid body of experience in bringing together key thought and action leaders around common issues in STEM before STEM was a movement.

### Purpose, Vision, Values and Mission

SCCMS is a purpose-driven organization. We seek to inspire learning and leadership in STEM education in schools, out-of-school time, business and industry, and community.

We envision all South Carolinians as exemplars of world-class STEM knowledge, skills, and life/career characteristics that enable successful careers and engaged citizenship.

We value serving those in need, creating synergies, thinking strategically, acting on opportunity, and reaching for the impossible.

We fulfill our purpose by identifying and addressing Grand Challenges in STEM Education through partnerships, advocacy, and public engagement.

### Things we do

As a managing organization, SCCMS has actively engaged partners for the purpose of offering aligned STEM efforts across the entire South Carolina STEM Ecosystem by:

- providing instructional support for educators
- promoting out-of-school learning experiences through collaborating with business and industry
- creating experiences for ALL through statewide STE(A)M festivals
- providing information and resources virtually

## OUR GRAND CHALLENGES JOURNEY

In 2017, with the support of a STEMx challenge grant, and building on 100Kin10's national grand challenges maps and research, we set out to develop a comprehensive map of grand challenges in STEM education for South Carolina and to identify five priority challenges that would guide South Carolina's

STEM effort for the next five years. We also defined a method for mapping a STEM education ecosystem's challenges and to identifying priority areas at the state level with the intent of guiding similar actions by other STEMx members.

### **SC's Grand Challenges in STEM Education**

*Engage individuals and organizations in advocating for quality STEM education.*

Increase communications among networks and stakeholders of education, business, community, and economic development to advocate for quality STEM education in community, school and out-of-school learning settings.

*Build awareness of the value of STEM education and career opportunities across the community.*

Increase communications and connections between educators, business sponsors, and economic development leaders by developing a virtual infrastructure for meetings and accessing STEM resources.

*Expand educators' STEM content knowledge and career awareness through professional learning experiences that engage SC's STEM business/industry experts.*

Build awareness for STEM opportunities in the state with a focus on STEM careers. Seek community partnerships beyond financial contributions. Create a STEM workforce pipeline of opportunities. Set STEM focus standards for each grade level and list possible partnerships that align to the content.

*Build leadership capacity of STEM educators, including school & district administrators, both in schools and across the community.*

Develop and implement a plan to increase STEM leaders in a pilot district in SC. Create a STEM leadership cohort, sponsored and supported by SCCMS and/or business and industry partners. Provide support for administrators and teacher leaders as they grow in STEM leadership roles.

*Recruit and retain STEM educators through financial and other incentives.*

Continue to enhance the STEM Educator of the Year program with the support of S.C. Future Minds. Grow a network of STEM educators to share knowledge / resources and showcase STEM teacher success. Seek connections with businesses to establish opportunities for co-teaching and externships.

### **Bringing SC's Grand Challenges in STEM Education to a Rural Region**

Rural is surprisingly close to home. US Census Bureau data indicate that a majority of Americans (54.4%) living in rural communities are, in fact, residing within what are designated as metropolitan areas. The rural population of South Carolina holds true to the national pattern. It is largely clustered in the vicinity of urban areas. (See US Census Bureau map in Appendix A.)

Rural challenges are, not surprisingly, close to home, too. Low teacher pay, limited professional learning opportunities, minimal internet access, lack of advanced course work for would-be STEM students, and a perception that STEM jobs are all somewhere else are just some of the challenges for rural communities identified by panelists and participants in a STEMx session at the July 2019 NSTA STEM Forum & Expo in San Francisco. Again, South Carolina holds true to the national pattern.

In response to another STEMx grant opportunity, we proposed to look at challenges and opportunities in rural STEM Education using the same set of lenses we employed to identify our statewide, *Grand Challenges in SC STEM Education* in 2017. [The 100Kin10 Challenge Tree for STEM Education](#) offers an exploration of root causes and possible actions to address the critical shortage of STEM teachers. More broadly, the overarching themes and catalyst challenges offer a structure for dialogue and discussion

around STEM Education issues relevant to a specific region and direct convening participants toward known pathways to success without being prescriptive. Knowing, for example, that “Bonuses for STEM Teachers” are catalysts toward increasing the prestige of STEM teaching, identifies a pathway without limiting how a community defines “bonuses”.

### **The I-77 Corridor as a Rural STEM Ecosystem**

Given that rural is close to home, we could have selected any number of communities within South Carolina. The I-77 corridor links Chester, Fairfield, Kershaw, Lancaster and York counties to the rapidly growing, STEM resource rich, urban centers of Charlotte, NC and Columbia, SC. These counties, with the exception of York, are identified by the US Census Bureau as “mostly rural” meaning that over 50% of their residents reside in rural communities. York County, with a rural population of 23.0% was included as it serves as a home base for one of SCCMS’ regional [S<sup>2</sup>TEM Centers](#).

Resources within the region included our planning and funding partner, the [J. Marion Sims Foundation](#), which is committed to rural community building, and the University of South Carolina’s [All4SC](#) initiative that marshals resources from the entire university in order to address challenges facing highest-need school communities in Fairfield County. Additional financial support for this convening came from the Chester Healthcare Foundation.

## **PREPARING FOR THE RURAL STEM CONVENING**

### **Roles:**

The SCCMS team led in developing convening logistics, invitations/registration, pre-convening work, implementation, agenda planning, grand challenges maps localization, meeting facilitation and next steps. This team also provided facilitators for the day-of the convening as well as additional staff support. The J. Marion Sims Foundation assisted with agenda planning, developing the invitation list, support for the convening and small breakout facilitation.

### **The Invitation List**

The invitation list included organizations and individuals representing all aspects of vibrant rural communities. The list, totaling over 175 persons, included educators, business leaders, elected officials, community organizations, tribal leaders, and parents who were known thought and action leaders from counties along the I-77 corridor with interest in STEM education. Additionally, an invitation was extended to representatives of STEMx member states.

### **The Guiding Question**

Of all the actions a community could take, what 3-5 would make the biggest impact for STEM Education in a short period of time?

Knowing the positive outcomes of the initial Grand Challenges Summit in 2017, our goal was to create a day of collaborative learning and sharing that was similar in the previously successful structure, yet different enough to meet the needs of the specified, rural audience. We knew that some of our participants would be the same persons who participated in the initial summit. We also knew from these participants that rural areas faced the same Grand Challenges in STEM education that resonated with thought and action leaders from throughout the state in 2017.

What we needed to know from this convening was:

1. To what *degree* do our statewide Grand Challenges affect our rural schools?
2. What *resources* are in rural communities that can be utilized to address these Challenges?
3. Where are the *gains* (successes) in STEM Education in our rural communities and how might we expand those gains?
4. What *gaps* (roadblocks) exist in STEM Education in our rural communities and how might we minimize those?

Given these lines of inquiry, the SCCMS team developed an approach for applying the 100Kin10 Grand Challenges, as well as, our identified SC Grand Challenges in STEM Education to the local, rural community setting.

### **Know before you go!**

Prior to the convening, our participants were sent a “Know before you go!” email containing a link to 100Kin10: [Trends and Predictions that will Define STEM in 2020](#) report along with focus questions to guide their reading. Additionally, they received links to statistics compiled by the Education Commission of the States and to SCCMS’ [Grand Challenges in SC STEM Initiative](#).

## **THE DAY OF THE RURAL STEM CONVENING**

Unlike previous STEM conferences developed by SCCMS, the convening’s focus for thought and action was intended to come primarily from participants rather than speakers, panelists or session presenters. As such, the SCCMS team devised protocols to engage attendees in networking, exploring challenges from 100Kin10’s Grand Challenges Map through the lens of our statewide five Grand Challenges in STEM education, and then taking a deep dive into one of the five SC Grand Challenges identified in 2017. External expertise would be engaged only with limited, strategic intent.

### **The Big Picture – STEM at the Federal Level and a Rural State’s Response**

The convening began with an overview of the 2018 White House Office of Science & Technology Policy’s strategic plan for STEM provided by Dr. Jeff Weld who spearheaded the plan’s development. Additionally, Dr. Weld identified ways in which the state of Iowa acted in response to the plan.

### **The “Heat Maps”**

A key participant engagement strategy focused on developing “heat maps” of existing STEM resources and initiatives in the rural communities along the I-77 corridor. The heat maps would show us who was addressing STEM challenges, as well as provide insight as to where we might gather additional recommendations and ideas to meet rural communities’ most immediate needs. (See a sample heat map in Appendix B.)

The creation of heat maps was catalyzed by use of challenge statements extracted from the 100Kin10 Challenge Map. Participants engaged in small group dialogue (randomly assigned) around one of SC’s five Grand Challenges to determine which of the 100Kin10 challenge statement(s) might belong to that challenge and why. Initially, participants felt that they should somehow be able to align each of the 100Kin10 challenge statements with their assigned SC Grand Challenge. As the protocol progressed, attendees became more familiar with the challenge statements and discussion shifted from fitting everything in to identifying ways in which the statements may, in fact, represent challenges within their

own community. Ultimately, they came to agree that that selectivity yielded more potential for actionable results than trying to address every challenge.

In a whole group session, teams shared their learnings, interesting points of dialogue, and questions that remained unanswered. They posted their sorted statement charts which were labeled with blue post-it notes to “tag” challenge areas where work was in progress (gains/successes) and to identify who was doing the work. The sorted statement and tagged “heat maps” then served as a visual for use in the ensuing Deep Dive sessions. But first, there was lunch and a special guest speaker, Ms. South Carolina.

### **The Local Picture – Ms. South Carolina**

Morgan Nichols, Miss South Carolina 2019, described her journey from a small town to a career in biotechnology. Her platform as Miss South Carolina is focused on STEM education and promoting career development for the life science, technology, engineering and mathematics fields especially for young women. #strongerwithSTEM

### **The Deep Dive**

For the Deep Dive sessions, participants selected one of five challenge team focus groups (see below) based on their expertise, interest, background, community need, etc. Their choices gave us an immediate data point: Grand Challenge Team 3 and Team 4 were combined as only three persons were interested in Team 4. Grand Challenge Team 2 was a popular choice with participants, followed by Grand Challenge Team 1 and finally Grand Challenge Team 5). Free choice gave us insight as to participants’ “what” but not their “why”.

### **Grand Challenge Teams**

**Team 1**-Engage individuals and organizations in advocating for quality STEM education

**Team 2**-Build awareness of the value of STEM education and career opportunities across the community

**Team 3**-Expand educators’ STEM content knowledge and career awareness through professional learning experiences that engage SC’s STEM business/industry experts

**Team 4**-Build leadership capacity of STEM educators, including school & district administrators, both in schools and across the community

**Team 5**-Recruit and retain STEM educators through financial and other incentives

The Deep Dive into the SC Grand Challenges for our groups was fundamental to the day’s intended outcomes. Participants used the Futures Wheel to explore Gains (successes) and Gaps (roadblocks) within the challenge and to discuss possible actions. (See example Future Wheel in Appendix B)

Having expert facilitators for each group (SCCMS and J. Marion Sims staff along with Dr. Jeff Weld) ensured that dialog was focused, questions were answered (or scribed for future) and team data was gathered.

In reporting their conclusions from the Deep Dive Discussion, each group shared their big ideas, insights and their completed statement for “We would be crazy if we did not...” with the full audience of participants. (See example “Deep Dives Take-Aways” worksheet in Appendix B)

## **Individual Action Plans**

To close out the convening, participants were asked to address a post card to themselves that identified an action they would take to carry the agenda of rural STEM education forward in their sphere of influence. Postcards were mailed back to each participant as a reminder two months post Summit, which unfortunately, was in the midst of the COVID-19 pandemic. (See sample post card commitments in Appendix C.)

## **MAIN TAKEAWAYS FROM THE CONVENING**

First and foremost, the meeting validated our contention that rural communities face the same challenges identified in our statewide Grand Challenges initiative. Local STEM leaders rallied around the strategy of honing-in on those challenges, identifying gains (successes) and determining actions that will continue maximizing gains in order to move STEM teaching and learning forward. It was important for rural communities to hear and know that it is not about what they do not have; instead, it's about knowing how to use what they do have to continue making gains. Participants appreciated that they were not portrayed or perceived as "have nots" in the broader STEM ecosystem. Most importantly, participants made personal commitments to broaden their networks in the SC STEM ecosystem and to share what they have learned with their colleagues. (See samples of participants' wondering, inspiration and intrigue as posted throughout the day via stickie-note in Appendix C.)

## **PAUSE FOR PANDEMIC**

Less than one month after the convening, a city in Kershaw Co. was identified as having the first known case of COVID-19 in South Carolina. This city quickly became a "hot spot" for the virus. Shortly thereafter, schools across the state were shuttered and a "home or work" order was issued by the Governor. With schools, communities and lives in disarray all along the I-77 corridor and beyond, we put aside any attempts to follow-up on the outcomes of the convening.

## **NEXT STEPS**

As a first step toward reconnecting with convening participants, commitment reminder post cards were mailed out on May 5<sup>th</sup>. Additionally, we began a review of artifacts collected at the convening toward the purposes of publishing this "white paper" and being at the ready to catalyze some effort to increase STEM knowledge and sustain support for STEM Education in rural communities along the I-77 corridor.

A challenge, of course, is that the needs and resources identified at the convening all have to be reconsidered in light of the pandemic. Our expectations for STEM education may have to be altered in light of social distancing, increased reliance on virtual learning, and curtailed economic activity. All of these factors remain in question as of this writing. That said, we continue to explore ways in which to reconnect and bring our common themes from the day back to the forefront. When it is reasonable to do so, we will check in on participant commitments to action. And, of course, we will continue networking to support our communities even if it is via virtual means.

## NOTES FROM THE EXTERNAL EVALUATOR

The conference environment was positive from beginning to end. Facilitators avoided the common pitfall of allowing participants to focus deficits and problems. Instead the laser focus was on current successes and achievable solutions. Most discussions focused on what was already working (or would work). A consistent theme was for participants to focus on what rural districts actually have that is unique and different instead of what they lack. Throughout the day no incidents of griping or “poor me” discussions were observed. While limitations were not avoided, they were not the focus of any sessions or group discussions.

A strength of this conference was the incredible diversity of participants resulting in very rich discussions and a variety of solutions. They had little passive seat time. Instead, conference planners built in active group techniques to focus participants on the topics, sharing, with freedom to move around. Attendees had rich opportunities for regional (and beyond) networking.

Throughout the day, the conference leaders and outside “experts” availed themselves as active participants in every aspect of the day. This lent itself to an atmosphere where the experts were an integral part of the whole group. One-on-one discussions with leaders occurred throughout the day. Group sharing was handled so that reports were brief, clear, and not boring.

Dr. Jeff Weld’s presentation was an excellent meeting starter by providing an overview of STEM education issues at the national level and in rural, Iowa. It was well presented and well received by an audience that could have dismissed his perspective as being “not from here.” Jeff’s impact was enhanced because he stayed involved as an active participant for the entire conference. At least half of the participants were observed in conversation with him over the course of the day.

Morgan Nichols (Miss South Carolina) was another perfect fit for this conference. She has rural roots, a scientific and business background, and her “platform” for her year as Miss South Carolina was to increase awareness of and interest in STEM, especially among young women. She too was an active participant throughout the whole of the convening. She interacted with participants in one-on-one and group settings.

Group/team activities were carefully crafted to produce limited and achievable action items. Throughout the day, facilitators continued to narrow the focus on practical solutions. The wheel chart (molecule chart) used during the penultimate activity was a powerful tool to help groups clarify, limit, and focus on solutions.

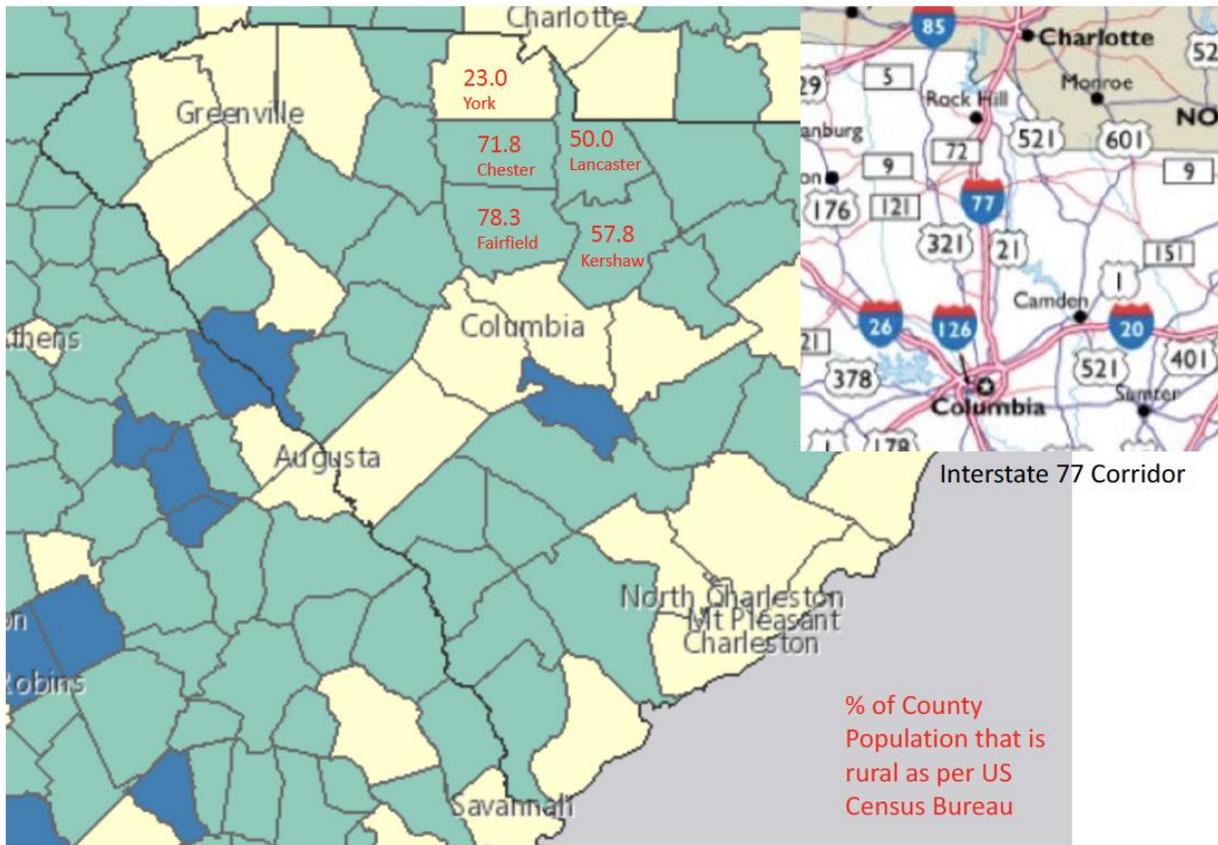
Some of the small group discussions might have gone a bit more smoothly had a little more time been spent orienting group leaders (Deep Dive Facilitators) for the afternoon breakout sessions. There was some confusion in several groups about what to do and how to do it. Nonetheless all groups were productive and eventually completed assigned tasks.

The convening concluded with a discussion of this question: “To which solutions are you willing to commit to move our agenda along?” Participants addressed post cards to themselves to serve as a written reminder of their commitment. These cards were collected to be mailed out to them in the in a few weeks.

Closing remarks focused on the theme that the convening was not the end, but rather the “end of the beginning” with a promise that more action would be taken.

This model would be easily replicated in other areas of South Carolina (or beyond). It might be interesting to recreate a similar conference with institutions of higher education to generate ways that they can best to prepare teachers for STEM education K-12 and how they can support STEM in rural settings.

## APPENDIX A – The I77 Corridor





## Sample Deep Dive "Take Aways" Team 4

Build leadership capacity of STEM educators in schools and across the community.

Rural STEM Education Convening  
February 11, 2020 || Richburg, SC

Deep-Dive Table Take-Aways

| Group Information  |  |
|--|--|
| Team (# and challenge)   | 4 increase/emerging teacher leadership roles   |
| Team Member Names  | [REDACTED]   |
| Gain (Center of Futures Wheel)   | Emerging teacher leadership roles  |
| Considerations & Actions   |  |
| Future Gains (or positives to consider building upon to increase success of identified gain) | - increase the number of teacher leader<br>- increasing teacher retention  |
| Future Gains - ACTIONS (Actions to Maximize Gain: Who? What? When? Where? How?)              | - Start w/ a particular school cluster (e.g. Title I)<br>- via professional learning community of support via local industry, parent organization etc. |
| Future Gaps (or negatives to consider that may impede progress)                              | - unstaffed classrooms<br>- decreased student contact w/ qualified teacher   |
| Future Gaps - ACTIONS (Actions to minimize Gaps: Who? What? When? Where? How?)               | - part of leadership role must include mentorship, co-teaching, model classrooms exhibition  |

Rural STEM Education Convening  
February 11, 2020 || Richburg, SC

For 2020-22 AY Implementation

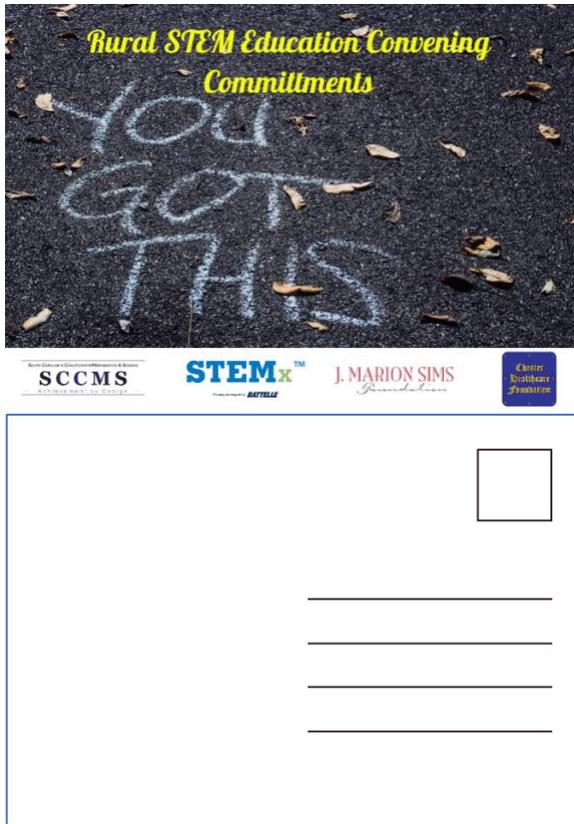
|   |   |
|---|---|
| Timeline (Consider which future actions take precedence what might that look like?) | Fall 2020 - Begin to identify resources and construct budget<br>Summer 2020 - Build PLC structure<br>Spring 2021 - Budget, identify staff<br>Summer 2021/Fall 2021 - implementation |
| Additional Thoughts   | - Need to have this type of planning session earlier for more immediate implementation<br>- potential to pilot w/ a school in 2020-21   |
| We Would Be Crazy If We Didn't...   | - get district approval (via Superintendent)<br>- STEM implementation @ some level <del>is</del> NOW<br>- Assets available now (District STEM advisory board)                       |

**Themes**

1. STEM Competitions
2. Mentors, Leaders, Coaches
3. partnerships w/ industry

# APPENDIX C – Sample of Participant Feedback

## Commitment Post Card and Sample Commitments



Expanding PLO and outreach experiences for K-12 faculty, administrators and students.

Stay committed to enhancing STEAM education at CMS and my community.

I promise to continue to research ways to expand STEM education in CCSD.

Corporately:

- Continue to improve Giti Math & Science Awards Program
- STEM Educator & Student Tours/"Hands on Experiences

Personally:

Stay relevant & work to intrigue & inspire students & educators in STEM improvement to make it relevant.

Continue to work through our STEM Strategic Plan and rebuild our school STEM committee.

Continue to network with industry and push for true STEM at the D.O.

Stay committed to growing and supporting FIRST teams in rural areas of SC. See what areas need the most growth and support. Reach out to local colleges, universities & community organizations for support. Don't forget these kids! #omgrobots

I want to commit to making STEM equitable across all our attendance areas.

JMS will commit to workforce development and opportunities for current students. You don't know what you don't know.

Keep up the good work! Fund new & best practices to implement STEM & STEAM career awareness to all students. Look back at your notes from the Rural STEM Convening & keep going!

Commit to reach out to local business and identify what they need from KCSD. Make it happen!

I am committed to developing a vibrant STEM program at Chester High. I am also committed to developing a partnership with local business!

Use my position with community youth to spread awareness of STEM

Continue to spread the message #strongerwithSTEM

## Sample “Sticke Note” Sharing

### Wondering

- How we can ensure that effective STEM ed is extended to rural schools.
- Ways we can serve our community that we may not have even considered yet.
- Not technical know-how, but political will regarding STEM ed.
- Promoting STEM extracurricular activities during the school day so as to be inclusive. How can this happen if we teach to state tests?
- About access to all students regardless of geographic area and student population.
- About state initiatives – common goals.
- How can I build better partnerships with industry around Kershaw Co. to benefit our students?
- About how STEM can produce an even more innovative healthcare field.
- How people enact STEM in their respective environments and with what resources.
- SC’s STEM Grand challenges.

### Inspired by

- The number of businesses and educators that had a specific reason to support the need for STEM ed in the rural community
- Young people who are willing to take risks to advance themselves into unknown careers and places.
- The thought of being a STEM/STEAM academy for our students and their learning opportunities.
- The amount of passion in this room. Everyone I spoke with was extremely passionate about their work.
- The commitment and faith in STEM education to prepare students for the future
- The knowledge base in the room
- The number of people interested in moving STEM forward in rural areas

### Intrigued by

- New perspectives
- Different implementation initiatives
- The influence of culture/region on STEM ed
- How to optimize STEM in Rural – underserved communities
- STEM and opportunities for my county/community
- The vast amount of opportunity that exists for students, yet they don’t even know about it
- The idea of rural communities having different cultures, expectations, needs, etc, from each other
- Finding new ways to help youth become interested in STEM
- Innovation – connecting the dots on how things are developed/created
- The path that STEM will move our state