OBTAINING A
COLLEGE DEGREE HAS NEVER
BEEN MORE IMPORTANT THAN IT IS
TODAY. BUT THE U.S. – ONCE A LEADER IN
HIGHER EDUCATION – NOW LAGS BEHIND AT LEAST
11 OTHER COUNTRIES IN TERMS OF COMPLETION RATES
FOR ADULTS AGES 25-34. INCREASING K-12’S COLLEGE
READINESS IS CRITICAL TO IMPROVING OUR OUTCOMES
IN THIS AREA. THE LSU CAIN CENTER’S STRATEGY
OF ALIGNING HIGH SCHOOL DUAL ENROLLMENT
STANDARDS WITH THOSE OF CURRENTLY
ENROLLED LSU STUDENTS SERVES AS A
MODEL FOR OUR STATE AND
THE COUNTRY.

F. KING ALEXANDER
President, LSU
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A BRIEF HISTORY

THE GORDON A. CAIN CENTER FOR SCIENCE, TECHNOLOGY, ENGINEERING, AND MATHEMATICS

Literacy traces its roots to 1993 with the formation of the “Center for Science and Math Literacy” in the LSU College of Education.

Over the next seven years, with the help of faculty from numerous departments, the Center obtained funding to develop curricula, perform research, and work to improve teaching and learning in the sciences and mathematics in Louisiana schools. In 2000, the Deans of Education, Basic Sciences, Arts and Sciences, and Agriculture outlined a plan to transform the Center, expand its mission, and make it an inter-collegiate unit housed in the LSU Office of Academic Affairs. LSU alumnus Gordon A. Cain backed the plan with a $2.5M endowment. Over the next 15 years, supported by over $35 million in federal, state and foundation grant support, the Gordon A. Cain Center for STEM Literacy worked to recruit, train and support teachers and better prepare students for college.

Today, the Center is led by a team of co-directors, drawn from departments across the LSU campus. The co-directors offer their time and talents to work on Center projects in addition to performing their regular research and teaching assignments in their home departments. The Center serves as a major education resource and outreach hub for LSU. Presently, it focuses on supporting college readiness and high-quality STEM education. Its programs strengthen Louisiana’s teachers in mathematics and in traditional and emerging science and engineering disciplines. The work of the Center impacts tens of thousands of students annually, improving their preparation for college and careers in the 21st century.
THANK YOU FOR YOUR INTEREST IN THE GORDON A. CAIN CENTER FOR STEM LITERACY.

We have a diverse group of people engaged in outstanding work to address the most significant educational challenges we face today. For over 20 years, the Cain Center has helped to improve student learning through a variety of programs. Today’s needs for STEM literacy and college readiness are greater than ever, so it is time for us to take the next step forward. This strategic plan will communicate our vision and path to the future.

Faculty from across LSU and the entire state work in a variety of ways to address our core mission. Some efforts are focused on the development of teachers, while others work closely with students to better prepare them for college. Other members of the Cain team focus on education research and advising educational policy. In the following pages you will see how these efforts reinforce one another and how the work of the Center supports LSU and the entire state of Louisiana.

The work of the Cain Center directly impacts our region’s ability to develop and maintain a quality workforce. Through all educational pathways, from technical and vocational training to college and beyond, this strategic plan builds on our record of achievement. For example, the LSU College Readiness Program, led by the Center, has become so successful that it has expanded outside of the STEM disciplines and now includes departments in the humanities, arts, and social sciences. The program includes summer classes and workshops that prepare teachers to offer high-quality courses, including dual enrollment to earn LSU college credit. It is the only program of its kind that is fully aligned with the standards of LSU and major research universities across the country.

Our new Lee Magnet High School Partnership goes a step further, featuring formal collaborations that help shape and sustain the school’s project-based academies of Bioscience, Digital Media & Arts, and Engineering. LSU faculty and graduate students participate directly, boosting research and collaborative grant funding. Our support for LSU’s GeauxTeach undergraduate teacher preparation programs and the LSU College of Science professional graduate programs for teachers addresses the severe STEM teacher shortages across the state. When we examine the data, we find clear evidence that students of teachers impacted by the Center arrive at LSU better prepared to succeed in college!

The Center and its extensive network of STEM teachers and professionals across Louisiana hope you enjoy reading about the work we do. We are dependent on your help. Please refer us to your friends, tell people about the need for our work in Louisiana, consider a gift, support us with any resources you have, volunteer, join our efforts, and become a part of “bringing the joy of STEM learning” to students everywhere!

Sincerely,

RANDY DURAN
Chair and Executive Director
Gordon A. Cain Center for STEM Literacy
IN THE UNITED STATES, INEQUITY OF OPPORTUNITY AND the overall poor student performance in science, technology, engineering, and mathematics are of profound concern. International comparisons, such as PISA, show that American students are being outpaced by most other highly industrialized countries. The majority of high school students are severely lacking in STEM skills and training, and most college-bound students are not adequately prepared for rigorous studies in these areas. This is an alarming situation as STEM skills and post-secondary education continue to increase in importance for individual success and the security and prosperity of the nation.

JOHN SPAIN
Executive Vice President
The Baton Rouge Area Foundation

The Baton Rouge Area Foundation has consistently noted that our community needs a much stronger base of science and mathematics teachers in our schools. The Gordon A. Cain Center teacher programs are of critical importance to the quality of life in our community and across the state.
In our new long-range strategic plan, the Baton Rouge Area Chamber has made STEM education one of its top priorities. We have determined that our region’s talent needs to require more business engagement and better outcomes around STEM fields, starting in K-12 education. The Cain Center’s programs are of crucial importance to economic development, both here and across Louisiana.”

ADAM KNAPP President and CEO, Baton Rouge Area Chamber

The number of industrialized nations in 2012 whose HIGH SCHOOL STUDENTS PERFORMED BETTER THAN U.S. STUDENTS IN: **

MARYLAND RANKED #1 AT 29.6%

LOUISIANA RANKED SECOND TO LAST AT 5.3%

ONLY 6 STATES SCORED BELOW 10%

By 2018, it is projected that 63% OF ALL JOBS in the U.S. economy will require postsecondary education. **

By 2018, 92% OF TRADITIONAL STEM JOBS will be for those with at least some postsecondary education and training. **

Percentage of 2013 U.S. high school graduates ready for: **

COLLEGE-LEVEL SCIENCE 36%

COLLEGE-LEVEL MATH 44%

(College-level is defined as meeting the ACT College Readiness benchmark, which is a score of 18 in English and 22 in Math)

* Source: 10th Annual AP Report to the Nation, 2014

** Source: STEM Education Crisis sheet produced by National Math and Science Initiative
GORDON A. CAIN CENTER
FOR STEM LITERACY

OUR MISSION

THE CAIN CENTER SUPPORTS HIGH-QUALITY STEM EDUCATION and college readiness initiatives through programs and services that build capacity for successful teaching and student learning. The Center conducts research to improve teaching and learning in the STEM disciplines and provides information and insight to education policy makers.

At LED FastStart®, we’re proud of our ranking as the nation’s No. 1 state workforce development program. One of the best ways to build Louisiana’s workforce for the future is to develop deep talent in teaching STEM skills. Our major employers in energy, healthcare, financial services and manufacturing demand these skills. And nowhere is this truer than in the software development, digital media and IT fields, which make up Louisiana’s fastest-growing industry sector. The Cain Center for STEM Literacy at LSU — with its proven leadership in STEM teaching and student opportunities — is a valuable partner in this mission.”

JEFF LYNN
Executive Director
Louisiana Economic Development
FastStart
PROGRAMS & SERVICES
THE CAIN CENTER OFFERS A VARIETY OF PROGRAMS and services to support STEM learning, prepare and strengthen teachers, and inform the public.

IMPACTING STUDENTS, TEACHERS & SCHOOLS
THE COLLEGE READINESS PROGRAM
The College Readiness Program provides high-quality learning opportunities in secondary schools across the state. Teachers obtain training and certification that prepares them to work efficiently toward more ambitious learning goals for their students. Students are offered a continually expanding catalog of courses leading up to enhanced dual enrollment and advanced placement options. Students become better prepared for success through an introduction to the rigors and requirements of first-year college courses. This takes place while they are in the safety of the high school, where growth can be nurtured by parents, and students can receive individual attention in small classes. The program offers the following three types of courses:

- **DUAL ENROLLMENT COURSES**: Students take actual LSU courses in their classrooms and pay reduced tuition, earning college credit and high school credit concurrently. Teachers are trained and certified to facilitate the course with an LSU faculty member serving as the instructor of record. As of 2016 there were 15 disciplines and 37 courses with more in line to be added each year. This successful program is expanding to include the humanities, arts, agriculture, and kinesiology.

- **PRE-COLLEGE COURSES**: Participating teachers can elect to utilize curricula for pre-college courses developed by LSU faculty to better prepare students for college material. Currently available mathematics courses include Calculus, Advanced Math, Algebra II, Geometry, and Algebra I. Similar courses are being developed in other disciplines.

- **ACT PREP COURSES**: The College Readiness Program offers ACT preparatory courses to participating schools. This includes one course specifically for math and another for all four ACT content areas.

DATA OBTAINED FROM THE LSU OFFICE OF BUDGET AND PLANNING EXAMINED STUDENT GPA’S AT THE END OF THEIR FIRST YEAR MATRICULATING AT LSU.

STUDENTS WERE DIVIDED INTO TWO GROUPS:
**GROUP 1**: Students who took Math 1021 College Algebra and Math 1022 Trigonometry through LSU College Readiness Program for Dual Enrollment

**GROUP 2**: Student who took Math 1021 College Algebra and Math 1022 Trigonometry after graduating from high school and enrolling at LSU

<table>
<thead>
<tr>
<th>YR</th>
<th>GROUP 1 CA &amp; TRIG COLLEGE READINESS</th>
<th>GROUP 2 CA &amp; TRIG AT LSU</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NUMBER OF STUDENTS</td>
<td>NUMBER OF STUDENTS GPA AFTER YEAR 1 AT LSU</td>
</tr>
<tr>
<td>2011</td>
<td>102</td>
<td>3.105</td>
</tr>
<tr>
<td>2012</td>
<td>164</td>
<td>3.112</td>
</tr>
<tr>
<td>2013</td>
<td>255</td>
<td>3.071</td>
</tr>
<tr>
<td>2014</td>
<td>141</td>
<td>3.061</td>
</tr>
</tbody>
</table>

Source: Kristy Neal and Bernie Braun, LSU Office of Budget & Planning January 2016

LSU EARLY LEARNING ACADEMIES
One of our most exciting projects began in 2015 as the Cain Center played a vital role in forging LSU’s partnership with Lee Magnet High School in Baton Rouge. The partnership pilots LSU College Readiness courses at the school, supports curriculum innovation for the school’s academies of Bioscience, Digital Media & Arts, and Engineering, offers a spectrum of professional development opportunities to teachers, and links LSU faculty and students to the school’s academic programs. The plan is to expand this LSU Early Learning Academy model to other high schools, furthering the Center’s mission of enhancing teacher skills and better preparing students for college.

QUALITY SCIENCE & MATHEMATICS
The Quality Science and Mathematics (QSM) Grant Program was established by the Louisiana Legislature in the summer of 1992 for the purpose of providing approximately $162,000 annually, in $750 increments, for science and mathematics instructional materials and equipment to regular education mathematics and science public school teachers. The QSM program is governed by a council comprised of two representatives each from the Board of Elementary and Secondary Education, Louisiana Department of Education, Louisiana Systemic Initiatives Program, Louisiana School for Math, Science, and the Arts, and state-level teacher, principal, supervisor, and superintendent organizations. The Cain Center administers the program under the direction of the Council.

STUDENT ENRICHMENT
Student Enrichment includes a number of programs offered to students of various ages and disciplines such as: STEM Family Night, Science Fair Judging, You be the Chemist Challenge, STEMup Baton Rouge, Match Circle, and more.
FOCUS ON TEACHER-LEARNING

GEAUXTEACH MATH & SCIENCE
Quality teachers are in high demand. At LSU, GeauxTeach students pursue an undergraduate content degree in humanities (English, French, history, or Spanish) or math and science (biology, chemistry, mathematics, or physics) while earning a secondary teaching certificate. Without any additional credit hours, they can graduate in four years and be both certified and highly qualified to teach secondary courses in their content area. The math and science track of GeauxTeach is officially part of the College of Science and is supported by Cain Center faculty who provide instruction in many of the GeauxTeach courses.

MASTERS OF NATURAL SCIENCE
The LSU Master of Natural Sciences (MNS) is an attractive option for STEM teachers who want to advance professionally and improve the quality of secondary STEM education. It is a professional master’s degree program with tracks that focus on content directly relevant to math and science courses taught in grades 7 through 12. Improving the relevance, accessibility and quality of the graduate curriculum available at LSU to support the professional growth of STEM teachers, the MNS includes courses designed to build leadership capacity. Since 2009, the MNS has graduated more than 150 science and math master teachers and teacher-leaders. The impacted teachers improve STEM learning for well over 15,000 students annually. Twenty-two graduate-level LSU courses were created or modified and adapted to serve the program. Over 35 LSU faculty have taught for the program. Several graduates of the MNS presently work for the Cain Center as Master Teachers and Project Leaders.

GRADUATE EXTERNSHIP PROGRAM
Computer science, math, engineering, science, and language teachers are in high demand locally. To help address the shortages, the Graduate Externship Program enables school districts to obtain the services of LSU graduate students who teach courses in highly specialized, hard-to-fill subject areas while pursuing their graduate degrees.

MATH SCIENCE PARTNERSHIP (MSP)
Louisiana school districts, in collaboration with the Cain Center, have received numerous three-year Math Science Partnerships (MSP) grants for a total of $9.2M since the program’s inception in 2003. Funded by the Louisiana Department of Education, and awarded to districts on a competitive basis, each MSP program impacts approximately 35-40 elementary or secondary teachers per year. The research-based workshop format provides teachers with the deep science and math content knowledge and tools necessary to improve student learning and integrate real-world STEM applications into their lessons. LSU has collaborated with 16 districts to serve public, private, parochial, and charter school teachers: Ascension, Avoyelles, Baker, Central, East Baton Rouge, East Feliciana, Iberville, Jefferson, Livingston, Pointe Coupee, Rapides, St. Helena, Washington, West Baton Rouge, West Feliciana, Zachary.

PROFESSIONAL DEVELOPMENT
In addition to the MSP programs, the Cain Center runs a variety of special professional development workshops. Workshops are sponsored by the Louisiana Systemic Initiatives Program (LaSIP), Great Minds, ExxonMobil, Shell, the Louisiana Department of Education, the LSU/Southern University Regional Collaborative, and Louisiana school districts.

GORDON A. CAIN CENTER FOR STEM LITERACY

In comparison to their matched peers, STUDENTS WHO SCORE A PASSING GRADE ON AN ADVANCE PLACEMENT EXAM TYPICALLY:

- Earn Higher GPAs in college
- Perform as well or better in subsequent college courses in the discipline
- Have higher graduation rates and are more likely to graduate college within five years

Source: 10th Annual AP Report to the Nation, 2014
RESEARCH, DEVELOPMENT & SCHOLARSHIP

CURRICULUM DEVELOPMENT
Eureka Math and its open-access twin EngageNY Math are the first comprehensive curricula fully aligned with current standards presenting math in a logical progression from PK to 12th grade. Produced by nonprofit Great Minds with funding from New York state, the development of the curriculum was directed by LSU faculty and Cain Center personnel. Through Great Minds, Cain Center team members work with school districts that are using Eureka and instruct teachers on how to implement and teach the curriculum in their classrooms.

RESEARCH
Cain Center faculty are actively involved in research across a wide range of subjects. Team members’ research focuses on their specialty and includes areas such as curriculum development, growing teacher numbers, unique partnerships with school districts, enhancing learning capabilities.

GEAUXTEACH
Heather Bass, an LSU GeauxTeach graduate, has garnered the attention of the Bill & Melinda Gates Foundation for incorporating the latest in mathematics teaching tools and assessment measures in her Port Allen High School classroom. Bass’s experience using formative assessments led the Mathematics Design Collaborative (MDC) to videotape her co-teaching a math assessment project on time graphs with a fellow instructor. The MDC educational video will be used to teach math instructors how to incorporate formative assessments in their classrooms and will be widely distributed through Math Solutions, a Gates Foundation funded organization.

MNS
Iberville Parish began the Starship Program which features a curriculum focused on STEM knowledge. Many of the teachers of the program are graduates of the LSU MNS program. They brought the knowledge they gained for hands-on and inquiry-based learning to the Starship Program to transform the way students learn and excel.

QSM
“The QSM program is a valuable resource for Varnado High. Our school received a grant this year that gives our middle school students opportunities to develop understandings of mathematical relationships and connect math to everyday life using technology.”
- Jennifer Beninato
Principal, Varnado High School, Washington Parish

MSP
“MSP has impacted my teaching in a number of ways. One of the most dramatic was the use of questioning with the students. Learning to ask the right question drew students into the learning process, required them to become critical thinkers, and ultimately led to success on assessments.”
- Armetta Wright
MSP Participant, Magnolia Hills Elementary, EBR

DUAL ENROLLMENT
“The dual enrollment program along with the VPSB paying for the classes gives my students who are academically capable a unique opportunity that they would not normally have and most could not pay for on their own. Starting college with credits already in place along with the confidence they gain by proving to themselves they are capable of handling a college level class is priceless for my students.”
- Joseph Nagy
DE Teacher, Abbeville High, Vermilion Parish

LYNNE MUNSON
President and Executive Director, Great Minds
THE STRATEGIC PLAN

FOR THIS STRATEGIC PLAN, THE CAIN CENTER’S goals have been grouped under the four areas of focus: Students, Teachers, Policy & Leadership, and Research. While many of these areas overlap, grouping the goals helps us to better communicate our objectives both internally and externally.

2014-2015 SHORTAGES for elementary/secondary schools

The majority of states in the U.S. are in need of teachers for the following subjects.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Special Education</td>
<td>94%</td>
</tr>
<tr>
<td>Mathematics</td>
<td>88%</td>
</tr>
<tr>
<td>Science</td>
<td>86%</td>
</tr>
<tr>
<td>Foreign Languages</td>
<td>76%</td>
</tr>
<tr>
<td>TESOL/ESL</td>
<td>62%</td>
</tr>
</tbody>
</table>

*percentage of all US states
Source: Teacher Shortage Area Nationwide Listing, Department of Education
STUDENTS
Our ultimate goal is to better prepare students for success in college to propel them on to a successful, fulfilling career.

OBJECTIVE
Our goal is to better prepare students for success in college and propel them on to successful, fulfilling careers.

STRATEGIES
• Expand access to the LSU College Readiness Program to more high school students, providing a two-fold effect:
  More students will participate in dual enrollment and advanced placement courses, earning college credit while still in high school
  More students will have access to pre-college courses offered through the LSU College Readiness Program, better preparing them for success in college
• Expand the course offerings listed for LSU Dual Enrollment
• Develop additional high school course content for Pre-College Courses
• Expand the ACT Prep Courses program

IN 2007, ABOUT 1/3 OF PUBLIC MIDDLE SCHOOL SCIENCE TEACHERS either did not major science in college and/or are not certified to teach it. **

TEACHERS
Teachers are the front line to educating our students and we need to increase the ranks of highly qualified STEM education professionals. Our goal is to educate, support, and employ STEM teachers through a variety of innovative programs.

OBJECTIVE
Increase the ranks of highly qualified STEM education professionals. Educate, support, and employ STEM teachers through a variety of innovative programs.

STRATEGIES
• Expand the College Readiness Program to include more secondary teachers, affording them the opportunity to become certified to teach Dual Enrollment Courses and develop in their profession
• Create a statewide math and science professional development unit, which includes mentor training and support; long-term plans include expanding this unit nationally
• Expand STEM education undergraduate scholarship opportunities, graduate externships, and dissertation bridge programs for STEM teachers
• Align GeauxTeach and the Masters of Natural Sciences (MNS) program with state and national priorities in teacher certification to strengthen their value in workforce development and sustainable financial operations
• Build capacity of human resources in STEM education areas and develop a sustained network of opportunities for STEM education professionals

36% OF PUBLIC MIDDLE SCHOOL MATH TEACHERS in 2007 either did not major in math in college and/or are not certified to teach it. **

** Source: STEM Education Crisis sheet produced by National Math and Science Initiative
POLICY & LEADERSHIP

THE CAIN CENTER HAS THE POTENTIAL TO POSITION ITSELF as a significant resource in offering guidance in STEM education policy and best practices, and developing curricula, courses, and quality standards. The strategies in this section are grouped into two subsections: Policy and Leadership with specific objectives and strategies under each.
POLICY

OBJECTIVE

Articulate and disseminate evidence-based positions regarding STEM education in Louisiana and support best practices in STEM education.

STRATEGIES

• Conduct studies and disseminate evidence-based information related to policy issues and best practices
• Create a Cain Center advisory board representing a diverse constituency
• Advocate positions regarding STEM education issues such as standards, teacher evaluation, college readiness assessment, and use of school time
• Facilitate dialogue within the LSU community on STEM education issues
• Position the Center as an asset to LSU’s recruiting, international activities, and development

LEADERSHIP

OBJECTIVE

Take a leadership role in developing curricula and standards and solidifying the state’s efforts to better prepare our students for college; strengthen the impact of the LSU College Readiness Program on the university and the state.

STRATEGIES

• Contribute to the development of STEM standards and curricula for high school, career, and technical education
• Create and test replicable models for implementing LSU Early College Academies
• Tie the LSU College Readiness Program to LSU student recruitment and retention initiatives
• Coordinate the LSU graduate and undergraduate programs for teachers with the LSU College Readiness Program
• Expand the LSU College Readiness Program from a regional to a statewide entity
• Provide leadership regarding university and state policy related to college readiness and dual enrollment
• Create international awareness in regard to college readiness, enabling international students to successfully navigate the U.S. college experience
RESEARCH & DEVELOPMENT

IN THE FUTURE, THE CAIN CENTER SEEKS TO PRODUCE on-going research and partner with other research centers in an effort to provide evidence-based insight into STEM-education on both a statewide and national level. Two primary objectives are listed with strategies under each.

“One striking fact is that the complex world of education—unlike defense, health care, or industrial production—does not rest on a strong research base. In no other field are personal experience and ideology so frequently relied on to make policy choices, and in no other field is the research base so inadequate and little used.”

IMPROVING STUDENT LEARNING:
A Strategic Plan for Education Research and Utilization (1999)
Committee on a Feasibility Study for a Strategic Education Research Program
The National Science Foundation supports research and development on STEM education and learning to prepare a diverse, globally competent STEM workforce and a STEM-literate citizenry.

**OBJECTIVE**

Produce research on STEM teaching and learning and partner with other research centers to create knowledge to support STEM-education.

**STRATEGIES**

- Create the Knowledge Engineering in Mathematics and Sciences Institute. The Knowledge Engineering in Mathematics and Sciences Institute will be developed to spearhead all Cain Center research goals and act as a hub where researchers from around the U.S. and the world can form productive partnerships to tackle STEM-related educational challenges. In order to do this:
  - **Build relationships with researchers, policy-makers and education leaders**
  - **Seek partnerships with other research centers to increase research opportunities**
  - **Offer services in program evaluation and data analytics**
  - **Collaborate on educational initiatives at the state, regional, national and international levels**
  - **Produce scholarly reports and publications**

- Develop scientifically-based analytical tools to increase the productivity of teachers, curriculum writers, and learning organizations.
  - **Use technologies such as knowledge representation, ontologies and the semantic web**
  - **Make products accessible to teachers and curriculum writers using websites, multimedia productions, etc.**
  - **Bring these tools to the field through marketable products**
  - **Involve high-school, undergraduate and graduate students and their teachers**
MEASUREMENT

Each of our focus areas contains performance indicators that will be tracked and monitored internally within the Cain Center. These performance indicators include metrics for evaluating our success with this strategic plan and our overall mission. Periodic reports on our advancements will be made available.
**TEACHERS**
Increase the ranks of highly qualified STEM education professionals by educating, supporting, and employing through a variety of innovative programs.

Teacher training is implemented in the classroom.

Training is provided to teachers on policy changes and new innovative practices.

We learn from students areas that need improvement through research.

Research shows us the policy changes that are needed and we support and adopt those changes.

**STUDENTS**
Prepare students for success in College to propel them to successful, fulfilling careers.

**POLICY & LEADERSHIP**
Take a leadership role in developing curricula & standards acting as a voice for STEM education policy in LA.

**RESEARCH**
Produce on-going research and partner with other research centers in an effort to provide evidence based insight into STEM education advancement possibilities.