TEXAS A&M UNIVERSITY-TEXARKANA
CONGRESSIONAL FIELD HEARING TESTIMONY
Dr. C. B. Rathburn, III
President

United States House of Representatives
Committee on Science, Space and Technology
The Honorable Ralph M. Hall, Chairman
Committee Hearing
September 26, 2011
Texarkana, Texas

STEM Education in Action: Communities Preparing for Jobs of the Future

Honorable Chairman Ralph M. Hall and members of the U.S House of Representatives Committee on Science, Space and Technology, welcome to Texarkana, Texas and to the home of integrated STEM education in Texas. My name is C. B. Rathburn and I am honored to serve as the President of Texas A&M University-Texarkana. Thank you for inviting me to participate in this important hearing this morning to discuss lessons learned from a seven year partnership in Pre-Kindergarten through Baccalaureate Degree integrated STEM education and to address your questions regarding the development and operation of STEM education programs leading to the development of an enhanced workforce, economic development and job creation for our local communities. I am pleased and honored to have the opportunity to provide testimony to your committee today and to welcome you, Mr. Chairman, home to East Texas.

Your subject is critical to the future of our nation's economy. The tide of loosing high paying science, technology and engineering jobs to other countries is alarming but understandable when you consider the declines experienced over the last two decades in the performance of our students in math and science curricula and the production of both STEM field graduates and qualified STEM educators. This decline has been especially challenging in our smaller and more rural communities across our nation.

While America has experienced significant declines over the last decade in STEM education performance and resulting economic development as detailed in a variety of reports including the Educational Testing Services pivotal work, "America's Perfect Storm", other nations including China, North and South Korea and India are enjoying significant improvements in both postsecondary attainment in STEM fields and overall STEM education performance of their students. For the United States to regain and expand our competitive edge in the global economy, this trend must be reversed. Unfortunately, no quick fixes to this challenge exist.

Most recent studies on STEM education performance conclude that an integrated emphasis on critical math, science and engineering concepts must begin at the early childhood education level

and continue every year through high school for students to be adequately prepared for success in postsecondary STEM education. To accomplish this we must refocus our primary and secondary education resources and curricular structures to enhance core math, science and analytical thinking skills before we will see significant improvement in STEM postsecondary attainment.

The United States continues to face a critical shortage of well prepared STEM educators at all levels as well as the resources to support essential continuing professional development for STEM teachers currently in the field. This shortage is especially acute in rural communities where the need for STEM education and the resulting economic renewal through a well educated workforce is most needed. Texas A&M University-Texarkana is proud of the easily replicable partnerships created and tested with the Texarkana Independent School District, which have demonstrated great promise in reversing the declining tide in both STEM education performance at the PK-12 level and a significant improvement in STEM teacher preparation. We have developed a plan for the creation of a Regional STEM Research and Education Center as a collaborative with a number of school districts and partner universities across our four-state region designed to:

- Enhance the recruitment and production of STEM educators at all levels,
- Expand continuing professional development opportunities for current STEM educators designed to improve student performance in critical knowledge and skills areas and enhance the retention of current STEM educators and
- Develop a digital demonstration laboratory library to support current STEM educators in the field with special emphasis on the needs of STEM educators in rural and small school districts

We would welcome the opportunity to further develop and test these concepts and process as a model for use in communities across the nation.

In response to the questions proposed by Chairman Hall, I am pleased to provide the following responses and comments.

Texas A&M University-Texarkana is a comprehensive regional university serving the educational needs of East Texas and our diverse four state region. We are an institution of access and a proud member of The Texas A&M University System serving over 130,000 students annually through 11 member universities and seven state agencies across Texas. For the first 38 years of our existence, A&M-Texarkana served as an upper division and master's degree granting university but thanks to visionary local leadership and strong legislative support, the University transformed into a comprehensive regional doctoral level university over the last 24 months accepting our first freshman class and first doctoral students in the fall of 2010. The fall 2011 freshman class grew by nearly 300% compared to the fall 2010 class making us one of the fastest growing universities in the southwest.

A&M-Texarkana has a distinguished history in the preparation of professionals in all fields with a particular focus on quality teacher preparation. With the establishment of the STEM College at A&M-Texarkana in January 2010, our emphasis on the production of STEM graduates has expanded exponentially in the last two years. Our programs in computer science, electrical

engineering, biology, mathematics and nursing boast world class faculty and are growing at a tremendous rate. For the last two years a majority of our incoming freshman chose majors within the STEM College over programs in the other two colleges within the University. Presently the STEM College is searching for faculty to start a new program in environmental engineering and water and land management to take advantage of these great East Texas natural resources and the resulting potential economic development.

Texas A&M University-Texarkana has received accolades for the success of our undergraduate STEM students placing first and third in the past two years in statewide undergraduate research competitions in direct competition with universities such as Texas A&M-College Station. The STEM College has received funding from the National Science Foundation and the EPA in the last two years to support these research and workforce development programs.

The "Hedgehog" for the university, if you are a student of Collins work ***Good to Great***, is to be world class at partnerships. Our collaborative efforts in the creation of the Martha and Josh Morris Mathematics and Engineering Elementary School in recent years, coupled with the extension of this PK-16 STEM partnership through the middle and high school, has produced great student success and national acclaim. The Westlawn Professional Development School, in partnership with TISD as a new model of teacher preparation, has proven its worth over the last eight years. Our electrical engineering and computer science programs grew directly out of collaboration with local business and industry and were funded with the private sector investment of over $9 million. Students in these STEM fields are engaged in internships with organizations such as Cooper Tire and other local employers.

Our newest STEM initiative in environmental engineering is a direct result of a collaborative effort between the TEX-Americas Center, the City of Texarkana, TX and Northeast Texas Community College. The nearly $100 million environmental reclamation of the former Lone Star Army Ammunition Plant served and a catalyst for this initiative to develop critical education and workforce development programs for the emerging field of environmental remediation and environmental engineering. The University, in cooperation with the city of Texarkana and Tex-Americas Center, recently received an initial $300,000 EPA Brownfield training grant in preparation for this effort. This effort is projected to grow significantly in future years.

By far our largest collaborative partnerships in workforce development are with our regional community college partners in Texas, Oklahoma, Arkansas and Louisiana. We are committed to the "2+2" model of higher education and have recently initiated an expanded effort with all of our area community college partners to enhance the vertical articulation, joint student advisement and seamless transfer of students. We are convinced that this is the premier model for efficient, cost effective production of a skilled workforce at the baccalaureate level and that this partnership produces the best option for many students. With Texas A&M-Texarkana's lowest tuition and cost of attendance in Texas and the entire region, this also produces the best value for degree attainment for the student.

The major challenge impacting the performance and success of students in postsecondary STEM fields is clearly the core science and math skills of the entering students coupled with a ***"Google"*** mindset. With fewer students mastering higher level math and science skills up through

calculus, as demonstrated by falling math and quantitative measures on standardized tests such as the ACT or SAT and the growing challenge of unsuccessful remediation of basic skills at the postsecondary level, many students are simply not prepared for success in collegiate STEM courses especially in engineering and physics. In addition too many entering students lack the analytical and critical thinking skills essential to success in courses requiring creative inquiry and the application of the scientific method. Far too many students are content with a simple ***"Google"*** search to find the answer to a question rather than the scientific discipline to seek the answers through creative inquiry processes. This leads to the inability of today's student to conceptualize higher order STEM concepts and develop the analytical thinking skills necessary for success in these fields. These academic challenges along with the pressing financial burden of the cost of higher education often leads to students either dropping out totally or finding an easier course of study outside the STEM fields. In either way we are losing the production if critical graduates for the STEM fields.

The answer to this challenge is clearly demonstrated in the PK-16 STEM partnership operational in Texarkana today. Beginning with the Morris Math and Engineering Elementary School through the Texas Middle School STEM Academy, on into the Perot STEM Academy at Texas High School and directly into the STEM programs at Texas A&M University-Texarkana, students in our community are provided the opportunity beginning at the Kindergarten level to develop both a solid STEM background and the inquiry skills to be successful at the postsecondary level. A&M-Texarkana was involved at all levels of the development of this partnership from the design of the curriculum, to the design of the facilities, to the creation of a unique masters program to equip the public school teachers with the critical knowledge and skills to be successful in teaching the STEM concepts. The success of this partnership is documented in the students progressing through this system today and will be demonstrated over the next six years as successful graduates from the University.

With the creation of the STEM College at Texas A&M-Texarkana in January 2010 the number of students majoring in STEM programs has grown by 100% and the number of STEM graduates by over 50%. In 2011, approximately 10% of A&M-Texarkana's graduates were in STEM fields. Females represent approximately 66% of these graduates with minority representation at approximately 20%. Both these numbers are reflective of the overall percentages for all students in all programs at the university.

As previously stated the growth in the STEM College enrollments over the last 2 year at A&M-Texarkana has been exceptional. A majority of new freshman entering the university in each of the last two fall semesters have chosen degree programs in the STEM fields. Full-time equivalent student enrollment (FTE) changes over the last three years in STEM fields are as follows:

Biological Sciences	302%
Electrical Engineering	341%
Mathematics	301%
Computer Science	440%

Base on this surge in STEM enrollments we anticipate significant growth in STEM graduates over the next 4 years.

The primary reason for this growth has been the generosity of Anita and Truman Arnold and the gift of $10 million dollars over 10 years for new student scholarships. This opportunity coupled with our summer camps in robotics, forensic sciences and other fields for bright high school students have established Texas A&M University-Texarkana as a destination point for STEM minded students. The university has initiated a number of support efforts over the last two years including the First Year Experience program, the student tutorial programs and the ASK Center designed to support students in their studies and foster increased student retention. As all of these programs are new over the last 24 months, an evaluation of the success of these initiatives is premature at this time.

External funding from federal and other sources will continue to be critical to the success of our STEM education efforts. As a small regional university, our ability to attract federal funding is limited. Unfortunately many federal grant reviewers make decisions on new grant awards based upon the previous funding history for the university. Many federal grant programs provide "bonus points" in the review process for more "seasoned" universities with far more human and capital resources. Unfortunately, this serves as a road block for emerging comprehensive universities such as A&M-Texarkana in competing for these declining sources of support.

Access to information on various federal grant programs is available but the technical assistance critical to successfully compete for these funds is lacking. The Texas A&M University System has initiated a program of shared services designed to utilize the expertise and resources of Texas A&M University-College Station, the other regional universities and the seven state agencies within the system to assist emerging universities such as Texas A&M University-Texarkana in developing the resume and expertise critical to successfully compete for these federal resources.

In the fall of 2009, A&M-Texarkana received our first direct research grant from the National Science Foundation Grant in the amount of $300,000 to study multilayer neural network with multi-valued neurons and their application to image recognition and processing directed by Dr. Igor Aizenberg. This grant led to the creation of the award winning undergraduate computer science and electrical engineering student research team and will hopefully serve as the foundation for additional funding in this important emerging field for homeland security and medical image recognition.

Earlier this summer the University received an Environmental Protection Agency grant for $300,000 to support environmental workforce development and job training as a collaborative effort with the City of Texarkana, Texas and Texarkana College and serve as a foundation for the initiation of the new environmental engineering program at the university. We anticipate that this effort is the first step in a series of grants and partnerships to support our environmental engineering initiatives.

I would like to again express my appreciation to Chairman Hall and the membership of the Committee on Science, Space and Technology for the opportunity to present Texas A&M University-Texarkana to you this morning and our vision and please in the world of STEM

education and workforce development. We have a solid foundation built in Texarkana with our partners and look forward to working closely with your committee and various federal agencies as we together strive to regain our global prominence in Science, Technology, Engineering and Technology. I would be happy to answer any questions.

Respectively submitted,

C. B. Rathburn, Ph.D.
President
Texas A&M University-Texarkana
September 26, 2010

United States House of Representatives
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STEM Education in Action: Communities Preparing for Jobs of the Future

Support Materials
Presented By

Dr. C. B. Rathburn, III
President
TEXAS A&M UNIVERSITY-TEXARKANA

A Model for Comprehensive STEM Education

Regional STEM Research and Education Center

TEXAS A&M UNIVERSITY-TEXARKANA

Pilot Project

One of the major challenges to our economy is the production of college graduates in the STEM (Science, Technology, Engineering and Mathematics) fields. Without these graduates, we cannot attract and retain the critical knowledge based jobs necessary for a growing economy that supports local, regional and national development. Critical to this effort is the recruitment, training and professional development of quality STEM educators at all levels. Recent studies have documented the loss of seasoned educators from STEM fields, the lack of new educators going into and remaining in STEM education and the dwindling numbers of students interested in pursuing STEM careers, either as educator or as members of the STEM workforce. Texas A&M University-Texarkana is in an exceptionally strong position to address this national, regional and Texas challenge.

The collaboration among A&M-Texarkana, with its newly established STEM College, the College of Education and Liberal Arts, and the Texarkana ISD, with its distinctive Morriss Math and Engineering Elementary School and its middle and high school STEM Academies, presents a unique opportunity to address this challenge. These institutions propose to develop a Regional STEM Education & Research Center to meet the regional STEM education and workforce needs including:

- Enhancing the recruitment and production of STEM educators at all levels
- Expanding continuing professional development opportunities for current STEM educators designed to improve student performance in critical knowledge and skills areas as well as enhance the retention of current STEM educators
- Developing a digital demonstration laboratory library to support current STEM educators in the field with special emphasis on the needs STEM teachers in rural and small school districts

A pilot project is proposed to help identify the most critical needs, develop a program to address the immediate issues, assess the success of that program and utilize that opportunity to more effectively formulate the long-term strategies and tactics for operation of a Regional STEM Research and Education Center.

Pilot Project Description

Phase I

1. Form a group of educators from the University and TISD-STEM programs to begin an assessment process for K-16 curricular alignment focusing on areas where critical gaps, misalignments or ineffective instructional activities are evident as identified by lack of teacher preparation, confidence or frustration; poor student performance, interest, etc.
2. Develop summer workshops for regional STEM In-service teachers that present these misalignments and challenges and provide strategies and tangible activities that emphasize more indirect and student engagement oriented strategies to address these challenges.
3. Create a open electronic data base of teaching strategies, classroom and laboratory demonstrations and activities, as well as dynamic more interactive and relevant web based resources to enrich the STEM teaching environment. Develop these as electronic modules, such as Pod Casts, etc. available to all constituencies.
4. Assess the effect of the initial assessment and alignment activities and summer workshops on both teachers' and students' performance and attitudes towards STEM and STEM education.

Phase II

Utilize the outcomes from phase one to develop a Regional Center for STEM Research and Education that will:

1. Expand its assessment and developmental activities to all STEM curricular areas,
2. Support ongoing curricular alignment and development of more effective K-16 strategies and tactics for STEM education,
3. Continue developing and offering summer workshops for In-service teachers to present new strategies and tactics for more engaging STEM education and provide training for the activities a Mobile STEM Laboratory will bring to their school
4. Develop and operate a Mobile STEM Laboratory for the region that takes sophisticated laboratory based activities to our small and rural schools,
5. Develop a model Professional Development School in collaboration with A&M-Texarkana and Texarkana ISD for STEM Pre-service teachers. Have Pre-service teachers engage in the supporting Mobile Laboratory offerings.
6. Continue to enrich and expand our electronic data base of STEM resources for educators and expand STEM oriented information modules to those oriented to the general public that present new, timely and pertinent presentations on STEM issues and developments via A&M-Texarkana Pod casts, cable TV, etc.

Pilot Project Budget, Phase I

Professional Salaries (Three Years)	$297,022
Benefits	$47,500
STEM Teacher Stipends	$62,000
Travel	$16,200
Materials & Supplies for In-service workshops	$18,000
Electronic Classroom Equipment*	$42,200
Laboratory Equipment*	$19,500
Seminar Expenses	$22,800
Office and Miscellaneous Expenses	$ 5,500
Marketing and Printing	$ 4,250
ITV expenses for production of Seminars on TAMU-T Web	$44,500
Total	**$579,472**

*Budget Notes: These expenses are for the acquisition of electronic and general laboratory equipment to demonstrate new and engaging ways to enhance STEM experiences in the K-12 classrooms. This equipment will be especially valuable for the small and rural school districts where their limited budgets can severely restrict lab based offerings so critical in enhancing student performance.

Biography

Dr. C. B. Rathburn, III
President
Texas A&M University-Texarkana

Dr. Carlisle Baxter "Bix" Rathburn, III was appointed President of Texas A&M University-Texarkana in July of 2008. Prior to this appointment, Dr. Rathburn served as President of Savannah Technical College in Georgia for seven and a half years. Previous to his tenure in Savannah, Dr. Rathburn served in college leadership positions in two colleges in Texas and Florida, including a 16-year appointment with Galveston College in Galveston, Texas, where he served for five years as President. He has held leadership positions in academic affairs, administrative/fiscal services, planning and resource development.

Dr. Rathburn currently serves as a member of numerous national, state and local boards and commissions. He is an active member of the American Association of State Colleges and Universities and numerous other state and national professional organizations. He served previously as Chairman of the Board for both the Savannah (GA) Area Chamber of Commerce and the Galveston (TX) Chamber of Commerce and is currently a director for the Texarkana USA Chamber of Commerce. Dr. Rathburn was appointed by Governor Sonny Purdue (GA) as a director of the Georgia State Workforce Investment Board in 2006 and has served previously on the National Commission on Workforce and Economic Development, the National Commission on Instructional Technology and as an elected Commissioner for the Southern Association of Colleges and Schools. Dr. Rathburn has served in many other local, regional and state leadership capacities for various professional, community and economic development organizations.

Dr. Rathburn has received numerous awards including the 2007 Outstanding Graduate Award from the Institute of Higher Education, University of Florida, the 2006 Savannah (GA) Industrial Person of the Year, the Distinguished Service Award from the City of Galveston (TX), The Texas Association of Colleges and Universities 1996 Excellence in Higher Education Award, the 2003 Vision Award (Savannah, GA), the 2005 Georgia Oglethorpe Award (Baldrige program) and the Myrtle S. Bonner Award for Excellence in Education. Dr Rathburn is a member of Lambda Tau, Kappa Delta Phi, Tri Sigma and Beta Beta Beta honorary societies and is listed in Who's Who in Education.

A native of Panama City, Florida, Dr. Rathburn received an Associate of Arts Degree in Biology from Gulf Coast Community College, Panama City, Florida, in 1977. In 1979, he earned his B.A. with honors from Huntingdon College, Montgomery, Alabama, and received a Ph.D. in Higher Education Administration with an emphasis in educational research and evaluation from the University of Florida, Gainesville, Florida, in 1982.

Dr. Rathburn and his wife Adrianne have five children. He has been a Rotarian for 26 years (a Paul Harris Fellow) and attends First Baptist Church, Texarkana