

FLORIDA CENTER *for* RESEARCH IN STEM



LEARNING SYSTEMS INSTITUTE
FLORIDA STATE UNIVERSITY

LSI's 55 Year Legacy of Innovating Learning

In 1970, the Learning Systems Institute helped to rebuild the Korean education system, transforming it into one of the top countries globally in terms of education, particularly in mathematics, reading, and science. That groundbreaking work continues today in Florida at The Florida Center for Research in Science, Technology, Engineering, and Mathematics (FCR-STEM).

FCR-STEM was created by the Florida Legislature and competitively awarded to Florida State University in 2006. It is another highly respected center operated by LSI faculty and staff.

The mission of FCR-STEM is to help the State of Florida improve STEM teaching and learning in grades K-12 and prepare students for higher education and STEM careers in the 21st century. Through impacts on teacher knowledge and classroom practice, FCR-STEM strives to improve student achievement, narrow student achievement gaps, and increase student pursuit in STEM fields.

These broad goals are addressed primarily through high-

quality research, teacher professional development, and the development of innovative resources and tools to support instruction aligned with curriculum standards.

Through research conducted at FCR-STEM, our staff works to answer the question, "How can we improve STEM integration and teaching and learning for all students?" Our staff pushes for a scientific approach to educational research and supports the use of open science and experimental design in our work. The work includes reports of the impact of educational interventions on student learning in mathematics and statistics through various teacher learning programs.



FCR-STEM By the Numbers

1B

Resource views/
downloads delivered
by CPALMS

3M

Florida students
use CPALMS

300k

K-12 Florida
educators use
CPALMS

20k

Florida educators have
completed the Civics Seal of
Excellence course

550

Resources for Career
and Technical
Education

2,000

Florida teachers have participated in one
or more years of evidence-based CGI math
professional development programs through
FCR-STEM research and outreach projects

14k

High-quality
educational resources
are offered on CPALMS

1,000+

Teachers across the panhandle are
being trained to incorporate technology,
aerospace and advanced manufacturing
into the classroom

6,500

Florida math and science teachers in
more than 55 districts were provided
professional development as part of
the FCR-STEMLearn project

250k+

Math and science
manipulative kits were
distributed to schools
around the state

300/500

300 middle and high school teachers
and 500 elementary teachers trained to
incorporate hands-on STEM kits and 3D
technology into class lessons.



CPALMS is a unique platform developed by FCR-STEM at the Learning Systems Institute to support K-12 education in Florida. More than 300,000 K-12 Florida educators and approximately three million Florida students actively use CPALMS to access educational resources, information to help them teach and learn, and software applications to support them throughout.

PreK-2 Assessment

FCR-STEM is leading the creation of PreK-2 English language arts (ELA) and mathematics assessment items that will be on the Florida Assessment of Student Thinking (FAST), a progress monitoring assessment administered across the state, in which over 800,000 students participate three times per year. LSI has trained over 150 PreK-2 practitioners from across Florida to create over 5,000 ELA and math test items.

Based on our team's expertise and innovation, we are pioneering a new interactive assessment format and system for PreK-2 learners that utilizes LSI's capabilities to help teachers adapt their instruction based on instantaneous and informative data while providing a playful computer-based formative assessment.

Standards Aligned and Vetted Innovative Resources

The website is home to more than 500 Perspectives Videos, which are standards-aligned short video resources highlighting experiences and ideas from experts, teachers, professionals, and skilled enthusiasts. CPALMS features unique resources like 500+ Model Eliciting Activities (MEA) that allow students to apply their knowledge in real-life applications where problem-solving and critical thinking take the lead.

CPALMS also features over 1,500 original student tutorials, which are interactive online lessons that allow students to explore math, science, English language arts, computer science and social studies content. The development of these tutorials is a collaboration between K-12 educators, subject specialists, instructional designers, graphic designers, narrators, and others who collectively spend 200-400 labor hours to create each tutorial.

To meet the needs of teachers and students, CPALMS continues to innovate and provide new types of resources. Interactive Research Pages, which support K-5 students' development of independently using digital tools to research a variety of grade-appropriate interdisciplinary topics help to showcase a variety of literacy skills, like using text features, building vocabulary, and scaffolded notetaking, is one of the newest additions.

CPALMS and Civics

The CPALMS team has also led the development of educational resources for civics, including integrated resources that can be used in math, science, English language arts, computer science/coding, social studies, and fine and performing arts. Over 1,600 instructional resources, such as lesson plans, student tutorials, and videos, were created and distributed on CPALMS to address the newly adopted civics standards and how they can be integrated within all content areas. Civics family guides were created to help families better understand the civics initiative and civics topics covered in each grade, along with ideas on how families can continue learning at home.

CPALMS was chosen as the platform for the Florida Civics Seal of Excellence portal. Our team created the portal to deliver civics education instructional resources to all K-12 educators across the state. The Civics Seal of Excellence platform also delivers the Florida Civics Seal of Excellence Course. This course is a first-of-its-kind teacher training program with content aligned to Florida's Civics and Government Standards. Course modules feature video-based lessons created and delivered by 53 expert scholars and practitioners in history, government, and political science from Florida and around the country. The course takes participants an average of 55 hours over two months to complete and allows educators to add the Civics Seal of Excellence endorsement to their Florida Educator Certificates.

More than 48,000 educators have signed up to take the self-paced, facilitated course and more than 20,000 have completed the course. The LSI and FCR-STEM teams reviewed more than one million assignment submissions for the portal, which was built on the existing CPALMS platform in just two months by LSI staff. Florida Teachers have spent over 1.3 million learning hours on this course.



↑ Specialists and educators from around the state joined our team and representatives from the Florida Department of Education to review teacher-created assessment items in Tampa. → FCR-STEM is designing a CTE application to help the state manage all the programs, courses, and standards data, along with software tools and educational resources for teachers across the state.

Changing Instruction through Formative Assessments

Research suggests that well-designed and implemented formative assessment is an effective strategy for enhancing student learning. CPALMS provides districts across Florida with the Math Formative Assessment System (MFAS). The system includes tasks or problems that teachers can implement with their students, and rubrics that help the teacher interpret students' responses. Teachers using MFAS ask students to perform mathematical tasks, explain their reasoning, and justify their solutions. Rubrics for interpreting and evaluating student responses are included so that teachers can differentiate instruction based on students' strategies instead of relying solely on correct or incorrect answers. The objective is to understand student thinking so that teaching can be adapted to improve student achievement of mathematical goals related to the standards.

Professional Learning through Credentials and Certifications

FCR-STEM has established itself as a premier provider of large-scale professional development and workforce training. With a proven track record of supporting educators, including training over 20,000 teachers, in just 2 years, through the Florida Civics Seal course, FCR-STEM specializes in competency-based, flexible, and performance-driven learning experiences. As part of FSU's InSPIRE initiative, FCR-STEM is at the forefront of workforce development, collaborating with industry leaders to offer educator training and industry-recognized certifications.

FCR-STEM has developed its own Learning Management System (LMS) platforms, hosting interactive courses in civics and financial literacy that can be adapted for all content areas.

These platforms not only provide high-quality, research-backed training but also enable FCR-STEM to deliver micro-credentials at scale, allowing educators to gain specialized skills in a flexible, competency-based format. By leveraging technology and expertise in instructional design, FCR-STEM ensures that educators across the state and beyond have access to professional learning opportunities that align with the evolving needs of students, schools, and the workforce. Through these initiatives, FCR-STEM continues to be the leader in professional learning, STEM education, and industry-aligned workforce development.

Career and Technical Education Leverage CPALMS

CPALMS has expanded its support to include Career and Technical Education (CTE). The CPALMS team is designing and migrating a massive data set of CTE standards and course information to a modern, efficient, and usable tool set including resources for educators. The CPALMS CTE application will be used to help the state of Florida manage all the programs, courses, and standards data, along with software tools and educational resources for teachers across the state. This project will lay the foundation to build support for students, teachers and parents to explore CTE programs, careers, college degrees, and much more. This will create a one-stop-shop for CTE educators across the state to access resources for teaching and learning.

The CPALMS staff trained over 165 CTE educators to create more than 550 resources, which are the first of many CTE resources featured in the new CPALMS CTE application. The resources are grounded in research-based integration and engaging pedagogy to support Florida CTE teachers who reach over 460,000 students preparing for future work.

InSPIRE at FSU

Florida State University's Institute for Strategic Partnerships, Innovation, Research, and Education (InSPIRE) project is a 10-year \$400M initiative led by the President, VP of Research, and the Office of the Provost, in partnership with FSU Office of Research, College of Engineering, and Learning Systems Institute (LSI). The project aims to diversify the economic development of the panhandle's Gulf Coast counties through building infrastructure and educational opportunities focused on advanced manufacturing and aerospace engineering.

The InSPIRE workforce and educational development team is being led by FCR-STEM. InSPIRE will strengthen and grow the skilled and diverse workforce required to support and staff a thriving aerospace and advanced manufacturing ecosystem headquartered in Northwest Florida. The institute will ensure that workforce development efforts align with industry needs and requirements. The CPALMS team will be providing educational support and workforce development in high tech industries and engaging in STEM outreach activities to inspire and educate the next generation of innovators and leaders. Educators will be able to grow by experiencing learning pathways and courses that include topics like: Artificial Intelligence, Robotics, 3D Printing & Prototyping, Data Mining and Analytics, Entrepreneurial & Communication Skills, Computational Thinking and Coding.

CGI

FCR-STEM researchers have conducted several randomized controlled trials of a mathematics teacher professional development programs based on Cognitively Guided Instruction (CGI). The premises of CGI are that all students enter school with intuitive knowledge and abilities that can serve as the basis for developing their mathematical ideas, and teachers can help students learn mathematics by paying attention to student thinking to assess their understanding and base their instructional decisions on what they learn about students. In the CGI professional development program, teachers learn about robust, research-based taxonomies—several of which are represented in the mathematics curriculum standards. Teachers also learn about research-based learning progressions and how they relate to the mathematics curriculum standards. Teachers also develop a strong understanding of mathematics through the in-depth study of student thinking in the CGI program. Multiple randomized controlled trials conducted by FCR-STEM have found that the CGI program positively impacts mathematics teaching and learning—especially in grades 3–5.

Math Anxiety

The FCR-STEM team has developed a school-based intervention for children with math anxiety using strategies



↑ Teachers from the Florida panhandle visited the Polysonic Wind Tunnel at the Florida Center for Advanced Aero-Propulsion and Florida State's High-Performance Materials Institute as part of InSPIRE at FSU.

from cognitive behavioral therapy. In our test of the effect of the intervention, 114 children have received the intervention, with 99 children serving in a comparison group who do not receive the intervention. We will examine if the intervention leads to decreases in math anxiety and if changes in math anxiety relate to increases in working memory and decreases in the avoidance of math. We will then test the theory that these changes will lead to long-term improvements in math learning for children with math anxiety and help make their math learning a more positive experience. The program emphasizes fundamental science, technology, engineering, and mathematics (STEM) education research that generates foundational knowledge in the field.

Statistics and Data Literacy

Many of the fastest-growing job fields worldwide involve statistics and data literacy. Reports identify Data Analysis and Probability as the domain where mathematics teachers most need professional learning opportunities. FCR-STEM projects have supported the teaching and learning of data analysis and probability through various teacher professional development programs and the provision of high-quality curriculum resources. With support from the Institute of Education Sciences, FCR-STEM researchers are partnering with 18 Florida school districts to conduct a replication study of an evidence-based program called Supporting Teacher Enactment of the Probability and Statistics Standards (STEPSS) and hope to expand the model to more grade levels to find ways to support teaching and learning of this critically important area.