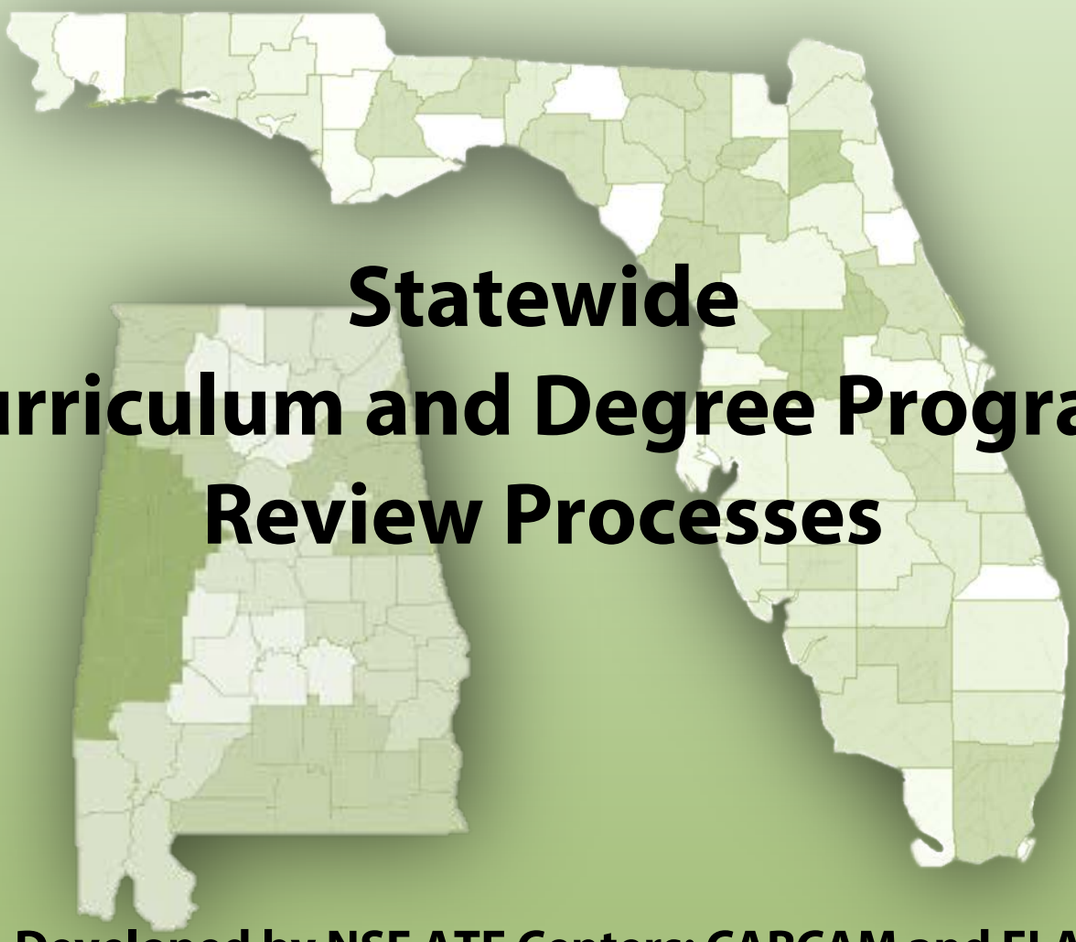
Best Practices Guide to:



Statewide Curriculum and Degree Program Review Processes

Developed by NSF ATE Centers: CARCAM and FLATE

Authors:
Beverly Hilderbrand and Marilyn Barger

CARCAM
Consortium for Alabama Regional Center for Automotive Manufacturing

FLATE
FLORIDA ADVANCED TECHNOLOGICAL EDUCATION CENTER
A National Science Foundation Regional Center For Advanced Technological Education

Partial funding for FLATE and CARCAM provided by the National Science Foundation
www.carcam.org www.fl-ate.org/

Contents

Students on Industry Tour to Plasma Thermal Plant in Florida

Forward

Advanced Technology Education (ATE) Centers funded by the National Science Foundation have become the nation's "go to" resources for updating, reviewing, and streamlining industry-relevant curricula for technician education. More importantly, they have been instrumental as models for setting up successful statewide curriculum.

ATE Centers, such as CARCAM and FLATE, are uniquely placed in that they bring together community colleges, four-year university partners, industry experts and partners, and government entities (like State Departments of Education and Offices of Public Instruction) to develop curricula for high quality technician education that addresses the most critical labor market needs in a given field and geographic region.

Both FLATE and CARCAM, in their respective state, follow a published process for curriculum/program improvements and updates that: 1) involves industry partners and educators, and 2) focuses on student learning outcomes /benchmarks (what do students need to know and be able to do).

NSF-funded ATE Centers also:

1. Offer neutral/non-college consensus on skills and knowledge required for a particular technical field
2. Have the resources to map industry skills standards and to continually update them
3. Have expertise in curriculum and curriculum processes
4. Gather resources that both educators and industry can use to find the best qualified technicians
5. Provide needed professional development for industry and educators getting involved with tasks and providing just-in-time education and training
6. Have and have access to content expertise in advanced/emerging technologies

In this *Best Practices Guide*, the Principle Investigators (PIs) of the Consortium for Alabama Regional Center for Automotive Manufacturing (CARCAM) Center and the Florida Advanced Technological Education (FLATE) Center describe the need for statewide curriculum in advanced technology fields. The PIs also share how their state manages the process of setting up statewide curriculum review, updates, and revision.

CARCAM offers an outreach model beginning in the secondary system to attract, enroll, and graduate a diverse population of students in manufacturing careers. This provides the region's next generation of manufacturing employees with the skills in automated control systems, robotics, and mechatronics systems essential to the future of *automotive and automated industry manufacturing*. Graduates of Automotive Manufacturing Technology (AUT) programs in automated manufacturing technology as well as related program options have a significant advantage over other job seekers due to the accomplishment of obtaining a multi-skilled technician degree and heightening their employability in a variety of industries. Faculty members from the member colleges, working in conjunction with faculty from other NSF Centers and projects, bring together significant experience and expertise in curriculum and instructional delivery.

CARCAM's signature Curriculum Gap Analysis has impacted numerous programs throughout Alabama through utilization as a model adopted by the Department of Postsecondary Education. It is now being used to advantage in updating other professional-technical programs; and guiding faculty decisions regarding curriculum redesign and showing evidence of high impact. The manufacturing workforce in Alabama has jumped from 5% to 12% in the past five years alone.[1] CNN Money cites **Alabama's high quality technical education** as one of the key factors encouraging manufacturers to expand in to the state.[2] Industry stakeholders are present and contribute end-to-end in the process. This industry involvement, recognition, and approval process has established employer confidence in community college graduates seeking employment at their plants and companies.

Alabama STEM Camp Students Touring Hyundai Plant

[1] CNN, "Alabama's Sweet Manufacturing Boom" http://money.cnn.com/2012/04/11/smallbusiness/manufacturing-alabama/index.htm July 23, 2012.
[2] ibid

FLATE is an NSF Center of Excellence in *high-technology manufacturing* and serves as the primary resource organization for manufacturing and advanced technical education, best practices, and resources supporting the high-performance skilled workforce for Florida's manufacturing sectors.

FLATE partnered early on to develop its signature A.S. in Engineering Technology. Additionally, FLATE took ownership of the tri-annual, legislatively-mandated statewide curriculum review process for the new degree. In partnership with the Florida Department of Education (FLDOE), FLATE worked closely with its partner colleges and industry representatives to rigorously review the standards and benchmarks that define both the Engineering Technology Core and the ten specialized tracks that make up the second-year of the degree program.

FLATE provides exemplary industry partnerships, workforce opportunities, and educational synergy throughout the state of Florida by connecting industry and workforce needs to targeted educational endeavors at fourteen community and state colleges across Florida. The Engineering Technology (ET) degree and certificate programs conceived, engineered, and coordinated by FLATE are the first of their kind to deliver a cohesive, comprehensive, fully articulated inter-institutional program which focuses on a set of core courses covering introductory computer-aided drafting, electronics, instrumentation and testing, processes and materials, quality, and safety.

These core skills support the Florida workforce, and align with the national Manufacturing Skill Standards Council (MSSC) Certified Production Technician certification, providing value-added benefits to industry. The Engineering Technology Core coupled with a second-year degree specialization prepares students for jobs in manufacturing and high-technology industries.

We hope our experiences will give you some guidance and insight helping you on your journey toward statewide, or even local and regional curriculum reviews, for career and technical education. We invite you to contact us if we can be of assistance.

Sincerely,

Marilyn Barger and Beverly Hilderbrand:

Principle Investigators: FLATE and CARCAM

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Meeting the Need for Statewide Curriculum in Advanced Technological Education: How to Manage the Process

The strategic need for a statewide, consolidated approach to advanced technology education is critical not just for the nation's economy, but for regional economies struggling to become competitive in the global economy. There is an ever increasing need for highly-skilled and multi-skilled workers who can meet industry needs locally to prevent jobs from being sent overseas.

In states like Alabama and Florida where high tech manufacturing jobs are now booming, there was once a great concern that is well summed up by a statement from Nancy Stephens, the Executive Director of the Manufacturers Association of Florida, who presented the following statement to the state's legislature, "addressing the needs for skilled workers is a required, competitive, and survival strategy for most manufacturers." If these needs are not met we will see the:

- Eventual erosion of our manufacturing base
- Loss of billions in business to other countries
- Decline of middle class
- Loss of economic diversification

Likewise, in Alabama, it became increasingly clear that the way out of the recession and economic downturn of the early 2000's was the development of a cohesive vision for curricula from the state's community colleges to provide work-ready employees for the fledgling auto industry that was starting to venture into the South and away from the traditional Detroit core.

In both states, the following roadblocks stood in the way of community colleges stepping up to the challenge posed by Ms. Stephens and further emphasized the need for a system-wide and statewide solution.

- Multiple community colleges offering a variety of degrees, programs or courses, some of which were updated and aligned to industry needs and others which were outdated by 15-20 years.
- Manufacturers interested in investing but concerned about the lack of a well-educated agile workforce
- Community colleges not addressing the needs of industry
- Limited or at best inefficient communication between the manufacturing sector and the community college sector at a statewide level on workforce education and training
- Lack of contact between faculty and hiring industries
- Manufacturers being unaware of what competencies community college graduates have given the vast variety of degrees, varying course names, and options

As part of the solution, effective curriculum review process models generally share the following key features/best practices:

1) They require frequency and regularity of reviews.
2) They identify and communicate a formalized process.
3) They involve faculty leaders and subject matter experts.
4) They involve industry for currency and relevancy.
5) They provide guidance for updates.

The Gap Analysis Flowchart and the Survey Process Flowchart show the general process and serve as a tool for a systematic approach to revising both programs and curricula statewide. The FLATE and CARCAM process models in this *Best Practices Guide* offer two different examples of how to address the same need and manage the process. The CARCAM process model is course-based and/or program-based. The Florida process refined by FLATE is based on curriculum standards and benchmarks. See the Summary section for other models and resources.

STEM Robotics Camp in Florida

Figure 1. Gap Analysis Flowchart for Courses and/or Programs

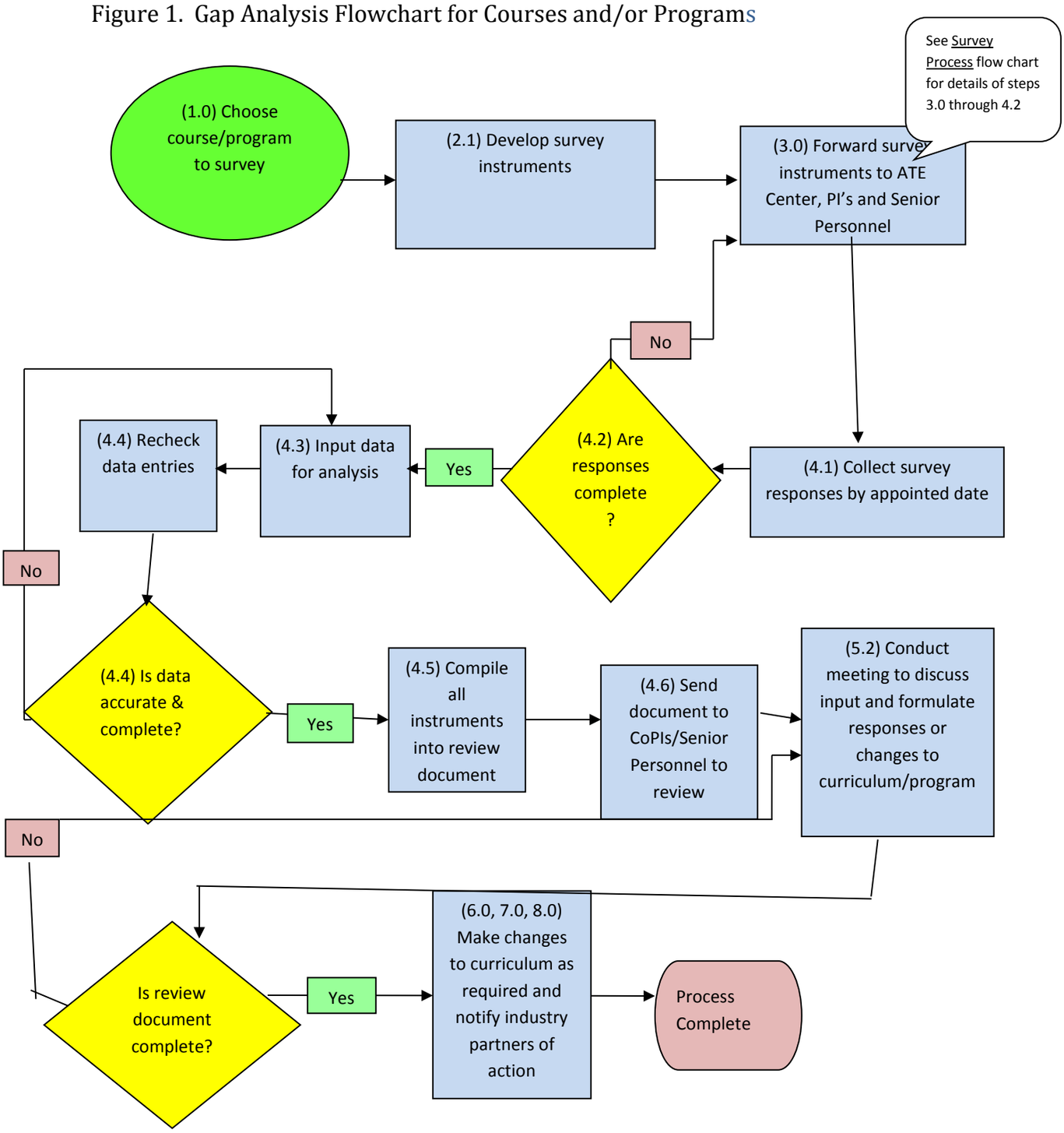
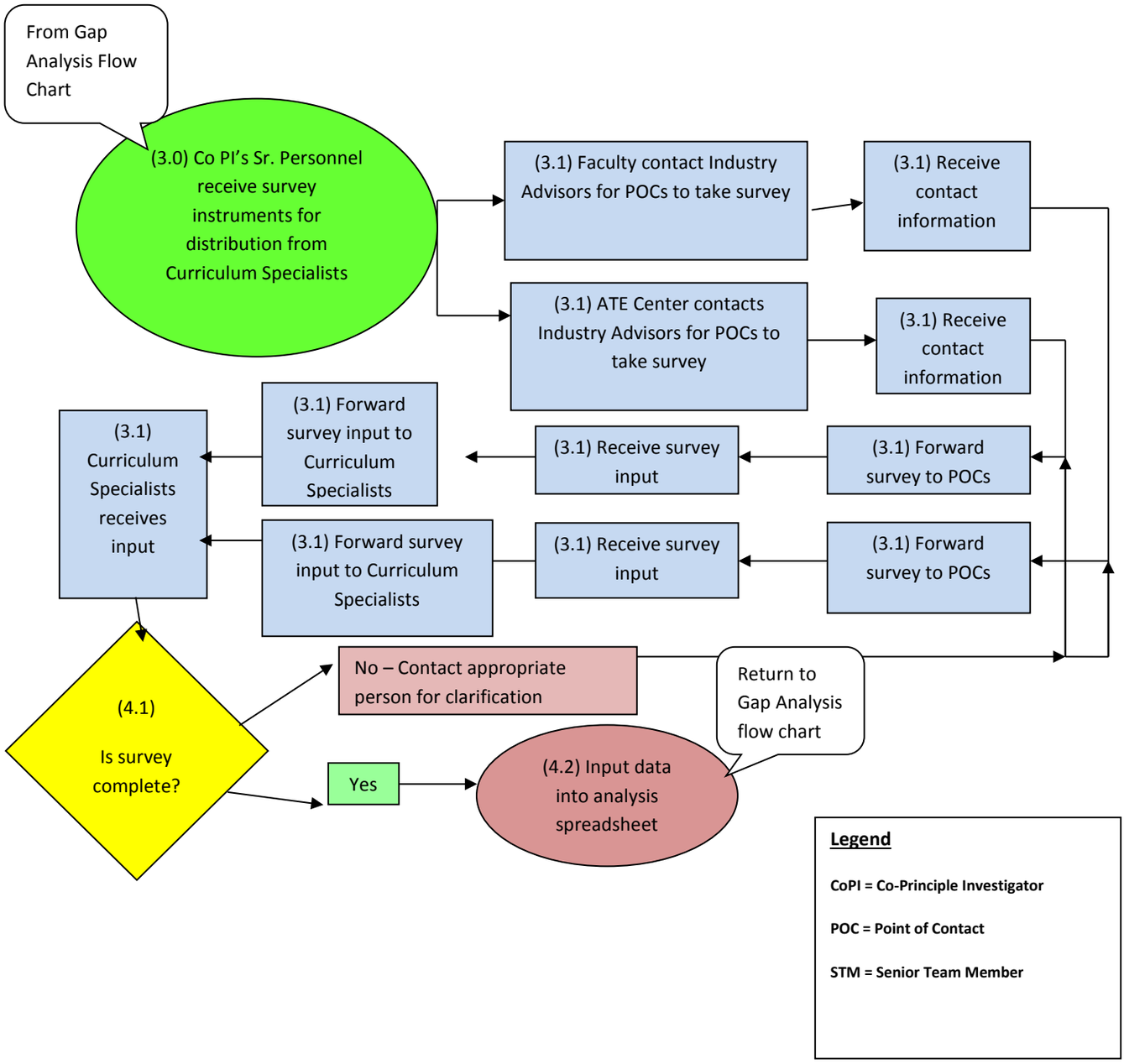


Figure 2. Survey Process Flowchart



CARCAM and the Alabama Process Model

"The Automotive Manufacturing Technology, or AUT, degree students will have a competitive advantage in the market place. The program is designed to develop skills we need in the auto industry to run successful plants and provide career growth for our employees."

Ron Davis P.E., Former Plant Manager ZF Lemforder, President AAMA, 2013

When the National Science Foundation's ATE program first funded the Consortium for Alabama Regional Center for Automotive Manufacturing (CARCAM) center in 2005 there was no specific automotive industry curricula in Alabama's community colleges that were ready to take on the task of educating the next generation of motivated, multi-skilled technicians for the automotive-related manufacturing industry.

CARCAM began the process of setting up statewide partnerships to produce process-oriented technical education programs that emphasize 21st century skills and problem-solving methods as well as integrate aspects of modern production systems and sustainable, lean /green manufacturing, automated control systems, and mechatronics.

To meet this critical need of both students and their potential employers, CARCAM created the Curriculum Gap Analysis (CGA) Model above to insure industry-relevant curriculum. To date, 29 courses have been reviewed through the Curriculum Gap Analysis tool. Today, as Mr. Davis (quoted above) notes, Alabama students graduating with AUT credentials have their choice of employment in the burgeoning Southern Automotive Corridor. Moreover, the CGA model developed by CARCAM has impacted a large portion of the colleges across the state, specifically in the areas of welding, machining, and electronics, as an efficient student- and industry- focused methodology to update curricula.

CARCAM has ongoing contact with industry partners in each of the college regions, to ensure that curriculum remains relevant and addresses changing technologies. The CGA continues to be an excellent tool to provide industry with multi-skilled technicians who have the core knowledge to make them employable with long term prospects for success and retention in the industry, and across industries. This employability quotient helps keep Alabama and the region as strong, competitive education, industry, and community partners.

The CGA process is enhanced with a CARCAM Curriculum Specialist on contract with the Department of Postsecondary Education (DPE) at the state level who works with CARCAM college faculty and provides assistance with continuous improvement oversight of the curriculum. CARCAM uses a statewide approach for continuous improvement incorporating both DPE and industry input.

In addition to the CGA, to maintain current focus and keep faculty and staff abreast of current skills requirements, CARCAM utilizes input from its Industry Advisory Council (IAC) which meets bi-annually with members from advanced and automotive manufacturing including Original Equipment Manufacturers (OEMs), tier suppliers, and the Alabama Technology Network.

CARCAM began the Curriculum Gap Analysis process to sustain industry focus and guide faculty decisions regarding curriculum redesign. Completing the CGA involves:

- Gathering expert advisor input for design of the survey instrument
- Working together to create the survey instrument and launching the survey with selected starter courses
- Surveying industry partners with assistance from craft committees, Alabama Automotive Manufacturing Association, Industry Advisory Council members, and former AUT graduates working in the field

Automotive Students in Alabama Programming Robots

The **Gap Analysis Management Checklist** in Appendix B details how to go about replicating CARCAM's process for the review of curricula.

See Appendix C for CARCAM Results of CGA Process Model. The model includes survey questions to engage industry in identifying relevant knowledge, skills, and abilities for current and emerging industry and employment needs locally and regionally.

Please contact CARCAM for additional sample survey and process materials.

FLATE and the Florida Process Model

"The process of reviewing the curriculum framework was a great exercise to engage our industry partners to ensure the program aligns with what our local employers need, as well as employers from around the state. We ensured the breadth and depth of the program as well as its appropriate flexibility to meet regional needs."

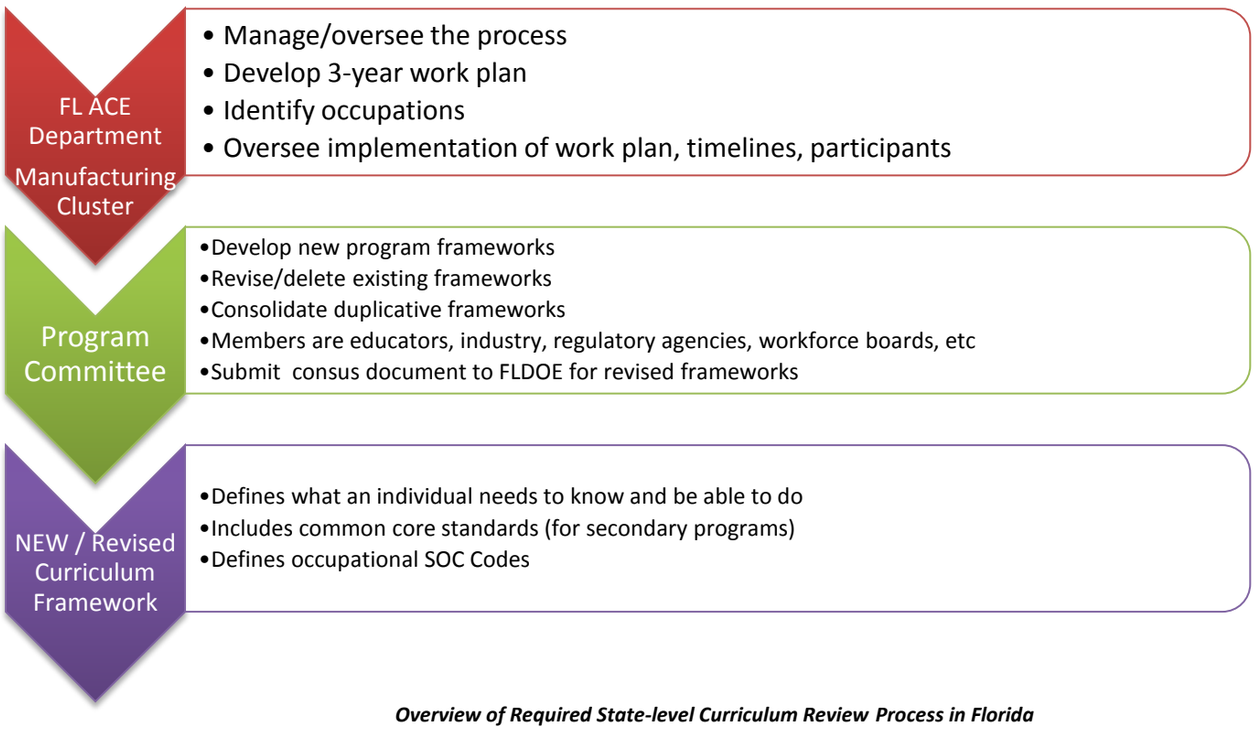
Adrienne Gould-Choquette, Professor and Program Director, Emerging Technologies, State College of Florida, Venice, FL

Under the leadership of Dr. Marilyn Barger, FLATE – an NSF ATE National Center of Excellence has helped lead the reform of Florida's Associate in Science (A.S.) degree supporting the technician workforce for manufacturing and related technologies. This reform has resulted in a statewide degree in Engineering Technology with a common technology core that offers ten different tracks (specializations) that define ten different second year programs of study. The second year track provide colleges a way to branch off the common ET technical core with courses in a track that best support their local industry needs. The ET Core, which is required by all ten specialization tracks, is aligned to a national industry-validated certification.

The Curriculum Review Process in Florida is not that different from the CARCAM/Alabama Model Process. Florida has the same components as in CARCAM's flowchart – however in Florida, the state documents that define a Career and Technical Education (CTE) program of study are called "curriculum frameworks" and are comprised of a number of benchmarks and standards. Standards and benchmarks define student competencies that must be attained for successful completion of the program.

In Florida, the Florida Division of Adult and Career Education (FLACE) guides the curriculum frameworks and review processes. The curriculum frameworks are applicable to all CTE programs at the secondary and post-secondary levels. At the post-secondary level, the frameworks do not define specific courses that colleges should use in a program. Colleges can use select courses from a state data base of courses, in which student learning outcomes for each are defined. Alternatively, a college can submit a new course to the system-wide database to address what the benchmarks and standards require.

See Appendix D: Summary of Florida's A.S. Engineering Technology 2012-2013 Curriculum Framework Review.



Overview of Required State-level Curriculum Review Process in Florida

FLATE and the Florida Department of Education (FLDOE) Curriculum Review Process

Technical educational curriculum in Florida is legislatively mandated to be reviewed every three years. The FLDOE identifies which programs are reviewed in what year. They identify who is offering each program. The process involves preparing the framework review survey "form" from the curriculum framework document by the FLDOE. The state supervisor of the industry career cluster prepares the review forms and identifies the institutions that offer a particular program.

A lead institution is selected to coordinate all the responses. A webinar by the FLDOE provides instructions and guidance for the participants and program leaders. The review forms offer the following choices for each standard and benchmark: keep as is; delete; update (requires suggested wording); addition (new standard and/or benchmark); and a comment column. See Appendix E: Florida Sample Survey Form.

Half of the reviewers must be industry professionals. Individual local or regional review groups can work together or independently to go through the frameworks or they can arrange to meet virtually or in person. Either way, the college lead person of these working groups must get signatures from the participants, aggregate the forms and develop a consensus document.

The consensus document with all suggested changes is submitted to the FLDOE State Supervisor over that program. The FLDOE supervisor reviews the suggested changes, and ultimately sends out a consolidated document to all the institutions who participated and others that offer the program but did not participate in the review, for a final opportunity for input to the new framework. This is the last chance for changes before the revised curriculum frameworks are cleaned up of all edits, reformatted back to the framework format and forwarded to the state-level approving committee.

Upon approval, the revised curriculum framework is posted to the FLDOE website and becomes the new guiding document for that program in all of the educational institutions offering it. The cyclic process ensures the reliability and currency of each curriculum/degree program that is defined as a career and technical educational program in Florida. The process takes 6-9 months.

Results of an Engineering Technology Core Framework and Specializations Review

In the 2012 curriculum review, 2 educators and 6 industry representatives reviewed the curriculum framework and specifics. Here are a few highlights of that review for the Engineering Technology (ET) core curriculum.

Starting with the existing 11 standards and 127 benchmarks:

- 12 new benchmarks added
- 1 standard revised for clarity
- 7 of the new benchmarks focused on sustainability-related skills and sustainable practices in production
- 12 benchmarks deleted as obsolete and no longer needed
- Over 45% of benchmarks revised for clarity

Specializations within Engineering Technology were also reviewed and updated by Program Review Committees of educators and industry representatives.

For example, in the ET Specialization of Advanced Manufacturing:

- 7 New benchmarks added
- 3 Standards updated for clarity
- 17 Benchmarks updated for clarity

Additional reviews were conducted for each of the following ET Specializations: Advanced Technology; Alternative Energy; Biomedical Systems; Digital Design and Modeling; Mechanical Design and Fabrication; and Quality. Contact FLATE for more information on the ET Core Framework and ET Specializations.

The FLDOE framework documents are posted online by career cluster and level for schools to use. The 2013-2014 curriculum framework documents for the ET degree is here: http://www.fldoe.org/workforce/dwdframe/1314/mfg/rtf/1615000001.rtf

Reliable, Current Instruction and Degrees across Institutions

Eric Owens, Senior Educational Program Director, Division of Career and Adult Education, at FLDOE, shares his view on the strategic need for statewide processes and standards within the Florida system:

> Rapidly changing technology in the workplace necessitates the constant review and revision of the curriculum utilized to deliver up-to-date instruction for career and technical education programs. To this end, the curriculum for all career and technical education programs is reviewed, at a minimum, every three years to determine if revisions are necessary. Review committees, comprised of both educators and business partners, assure that the curriculum being used to provide instruction in the almost 1000 distinct career and technical education programs is as current, reliable and relevant as possible to maintain the high quality of education that students and employers have come to expect from the programs taught in the schools, technical centers and colleges within the Florida educational system.

Another key administrator at the Florida Department of Education, Richard "Ted" Norman, State Supervisor for Manufacturing/Transportation, Distribution and Logistics, Engineering and Technology Education, Division of Career and Adult Education, offers the following perspectives: “One of the many challenges for maintaining high levels of rigor in a Career and Technical Education (CTE) program is to keep pace with emerging technologies. Education leaders need to come to the realization that for students to gain the skills needed for jobs and careers, students must be given opportunities to experience the latest technologies available in their chosen career path.”

Please contact FLATE for additional sample forms and process materials.

Summary

In addition to the Alabama and Florida curriculum review models detailed in this *Best Practices Guide*, there are a number of other models and approaches for curriculum review processes. Most states have a system-wide framework for curriculum reviews and revisions. The frameworks vary in design, levels of implementation, stakeholder engagement and input, complexity, timelines, and integration with other curriculum and discipline standards and benchmarks. Curriculum review processes for K-12 and Career and Technical Education (CTE) are especially well documented across various states.

For example, states such as Maryland, Massachusetts, Missouri, Oregon, Pennsylvania, Rhode Island, Texas, Washington, and Wisconsin, offer curriculum review process descriptions, visuals, and process guidelines, via their websites. The content can be accessed, referenced, and adapted. It is important to provide context to any framework being used.

Effective curriculum review process models generally include the following key features/best practices: 1) Requires frequency and regularity of reviews; 2) Identifies and communicates a formalized process; 3) Involves faculty leaders and subject matter experts; 4) Involves industry for currency and relevancy; and 5) Provides guidance for updates. Interested readers are encouraged to explore additional resources from California, Michigan, and New York, for systems and processes that may work better in their institution, system, region, or state.

www.cde.ca.gov

www.michigan.gov

www.nyctecenter.org

Professional organizations and societies, and their conferences and publications, are another useful resource for curriculum review process models and documentation. A literature review for specific disciplines, programs, and curriculum, may also yield results from a search on curriculum review process models.

Finally, the South Carolina National Resource Center for Expanding Excellence in Technician Education ATE Center (SC ATE) has created a Compendium of Research on Technician Education (TE). Readers are encouraged to explore this rich database of latest research and best practices at www.teachingtechnicians.org. Refer to Resources and a Search Bar to search proven and promising practices. This is an exceptional repository of current and emerging best practices for advanced technological education systems nationwide.

Appendix A: Glossary

AAMA: Alabama Automotive Manufacturing Association

AS: Florida Associate of Science degree

ATE: Advanced Technological Education Centers, a program of National Science Foundation, Department of Undergraduate Education

AUT: CARCAM and Alabama Automotive Manufacturing Technology (programs and degrees)

BSET: Florida Bachelor of Science Engineering Technology degree

NSF: National Science Foundation

OEM: Original Equipment Manufacturer

PDCA: CARCAM Plan, Do, Check, and Act, a four-part process

PI: Principle Investigator, term used by NSF

POI: Alabama Plans of Instruction

POC: Alabama Point of Contact

SC ATE: South Carolina ATE National Center

SOC: Florida State Occupational Codes

STM: CARCAM Senior Team Member

TE: Technician Education

DPE: Alabama Department of Postsecondary Education

ET: Florida Engineering Technology (programs and degrees)

FLACE: Florida Division of Adult and Career Education

CTE: Career and Technical Education

CIU: Alabama Curriculum and Instruction Unit

Co-PI: Co-Principle Investigator, term used by NSF

FLATE: Florida ATE Center of Excellence

FLDOE: Florida Department of Education

IAC: Industry Advisory Council

CGA: Alabama Curriculum Gap Analysis

Career Cluster Consortium: A Working Group Process

MCC: Florida Manufacturing Career Consortium (example of Career Cluster Consortium)

CARCAM: Consortium for Alabama Regional Center for Automotive Manufacturing

Appendix B: Gap Analysis Management Checklist

This approach is based on a course-level review process. The process can be generalized to review and assess programs, standards, and/or benchmarks as well.

1.0 Choose courses to survey

☐1.1 Evaluate number of courses taught by school and as a total across Consortium for Alabama Regional Center for Automotive Manufacturing (CARCAM) colleges.
☐1.2 Provide this information to CARCAM faculty and staff for review.
☐1.3 Open discussion to choose courses by consensus, grouping like courses when possible.

2.0 Survey and analysis instruments

☐2.1 Develop survey instrument for each course to be surveyed using existing Plans of Instruction (POIs). Ensure all POIs are updated to most current format.
☐2.2 Develop analysis spreadsheets to input data upon receipt.

3.0 Forward survey instruments to CARCAM Co-Principle Investigators (CoPIs) and Senior Team Members (STMs), CARCAM's Industry Advisory Committee (IAC), Alabama Automotive Manufacturing Association (AAMA) participants, and associated faculty.

☐3.1 Co-PIs present survey to their program's Industry Advisory Committees, former students working in industry, and faculty member's familiar with courses.
☐3.1 CARCAM Center in conjunction with Department of Postsecondary Education (DPE)/Curriculum & Instruction Unit (CIU) administers surveys to CARCAM Industry Advisory Committee and AAMA participants.

4.0 Completed surveys

☐4.1 Collect Surveys via email, fax or US mail.
☐4.2 Evaluate surveys for completeness.
☐4.3 Input data into analysis spreadsheet.
☐4.4 Recheck entries against original survey for accuracy.
☐4.5 Compile all survey data into final report document for analysis.
☐4.6 Send document to CARCAM Staff and faculty for analysis and feedback.

5.0 Joint meetings for feedback review and response

☐5.1 Schedule meeting/s for feedback discussion

☐5.2 With each piece of feedback for each course surveyed, pose the following questions:

☐5.2.1 Is this feedback asking for a change in this course?

☐5.2.2 What needs to be changed?

☐5.2.3 If something is missing, is it taught in another course?

☐5.2.4 Is the suggested change appropriate for the students taking this course or should it be implemented elsewhere?

☐5.2.5 Will this change require other changes to be made to this course or other courses?

☐5.3 After discussion, decide by consensus whether a change is warranted. If so move on to step 6.0. If no change is to be made go to 5.4

☐5.4 If no change is to be made, discuss appropriate response to the feedback with rationale and fill in Action Taken block on summary report.

6.0 Make changes to courses as warranted.

☐6.1 Update POIs with new or updated information according to feedback and discussion of faculty members.

☐6.2 Once completed send POI to faculty for final review.

☐6.3 Post the completed POI on the Alabama Community College System web site in the AUT POI section.

☐6.4 Update Action Taken block on summary report.

7.0 ☐Notify all affected colleges of curriculum changes.

8.0 ☐Notify industry partners of response to their feedback.

Appendix C: CARCAM Results of CGA Process Model

The CARCAM Survey Tool is a set of questions for industry. The questions ask industry to identify key knowledge, skills, and abilities for automotive and advanced manufacturing employees.

When the data from the survey is compiled, CARCAM and its partners have insight into current local and regional employer needs. With CARCAM's leadership, technical education faculty better understand how to update their courses and programs, and/or standards and benchmarks, based on market trends and input from industry. Industry experts represent – via their responses to survey, what is needed by their company (displayed as overall percentages in survey).

CGA DATA Results of Process Model, 2011-2013

- 74 Industry participants completed survey
- 29 course plans of instruction reviewed
- 9 courses received changes to curriculum
- 14 modules changed/updated within courses

CARCAM utilized the PDCA (plan, do, check, act) method for continuous improvement in designing the gap analysis model

CARCAM CURRICULUM GAP ANALYSIS PROCESS

- Select Courses and Develop Survey Documents
- Distribute Surveys to Select Companies
- Review Survey Responses and Input
- Data into Plan of Instruction for Analysis
- Make Curriculum Changes if Required
- Notify Industry of Curriculum Updates/Changes

CGA IMPACT

Appendix D: Summary of Florida's A.S. Engineering Technology 2012-2013 Curriculum Framework

This chart tracks the number and kinds of changes FLATE and its college and industry partners made to the ET degree frameworks in 2012 – 2013. Nineteen educators and 46 industry professionals participated in the reviews around the state.

2012-2013 ET Degree Framework Reviews

Reviews	ET Core	Advanced Manufacturing - Spec.	Advanced Manufacturing - Spec.	Advanced Technology - Spec.	Composite Fab. and Testing - CCC	Applied Technology Spec. - CCC	Alternative Energy - Spec.	Alternative Energy Systems Spec. - CCC	Biomedical Systems - Spec.	Medical Quality Systems - CCC	Digital Design and Modeling - Spec.	Digital Design and Modeling - Spec.	Mechanical Design and Fab. - Spec.	[1]CNC Machinist - CCC	Mechanical Designer and Programmer	Quality - Spec.	Lean Six Sigma Green Belt - CCC	[2]Six Sigma Black Belt - CCC	Totals
New Benchmarks Added	[3]12		7		0	0		6		2		7		1	1		3	6	**45**
Benchmarks Deleted	12		0		0	0		0		2		1		2	7		0	1	**25**
Benchmarks Updated for Clarity	6		17		3	4		1		6		16		29	1		3	4	**90**
Standards Updated for Clarity	1		3		0	0		0		0		2		0	0		0	0	**6**
Standards Deleted	0		0		0	0		0		0		0		0	0		0	0	**0**
# Educators Committee Members	2		2		1	1		1		2		2		2	2		2	2	**19**
# Industry Committee Members	6		5		2	2		9		3		4		3	3		4	5	**46**

[1]Consensus to add the word "Fabricator" to CCC

[2] The content and laboratory activities section were also rewritten for clarity and accuracy

[3] Described sustainable practices in production facilities

FLATE continually works within the Florida education system, as a liaison with the FLDOE, to support all Florida colleges offering or planning to offer the ET degree. This helps consolidate and minimize replication of courses in the ET degree at the adoption and implementation stage. Technician preparation and advanced manufacturing workforce readiness across the state of Florida are accomplished through ongoing work with technical educators. Activities involve developing the student pipeline to manufacturing careers; offering professional development workshops for educators, and expanding and facilitating articulations to Bachelor of Science Engineering Technology programs in Florida.

Appendix E: Florida Sample Survey Form

K	U	D	S	B	STANDARDS AND BENCHMARKS	COMMENTS
					12.0 Operate, troubleshoot, and maintain pneumatic, hydraulic and electromechanical components and/or systems – The student will be able to:	
					12.01 Identify, classify and describe the function of pneumatic, hydraulic and electrical machines and components.	
					12.02 Construct flow diagrams and of pneumatic, hydraulic, and electromechanical systems.	

This image is a small extract from the lengthy review survey form. It illustrates how information is captured from all reviewers. This particular sample is from the Advanced Manufacturing Specialization review survey form. The review forms offer the following choices for each standard and benchmark: **Keep** as is with no change; **Update** as noted in Comments; and **Delete**. Updates require suggested wording. Reviewers can also add a new **Standard** and/or **Benchmark**, and document their comments.

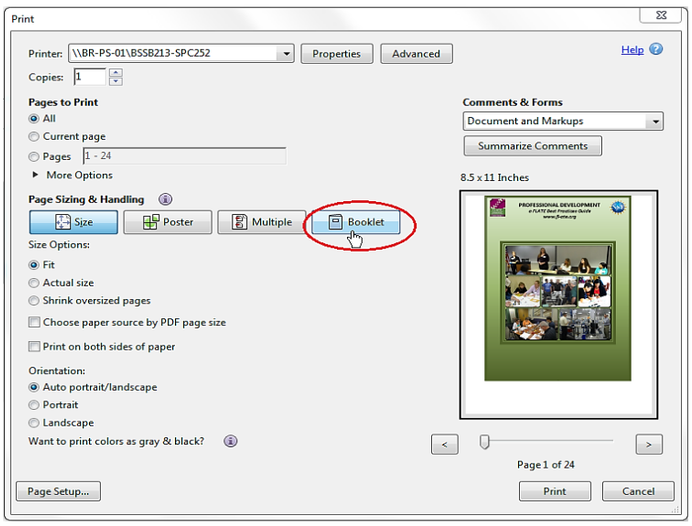
How to Print this Guide

If you would like to print your guide in a "booklet" format (from the original PDF file), please use the following steps, you will need a printer that can print double sided documents:

Step 1 – select Booklet under Page Sizing and Handling *(please make sure you are using a printer that prints double sided documents).*

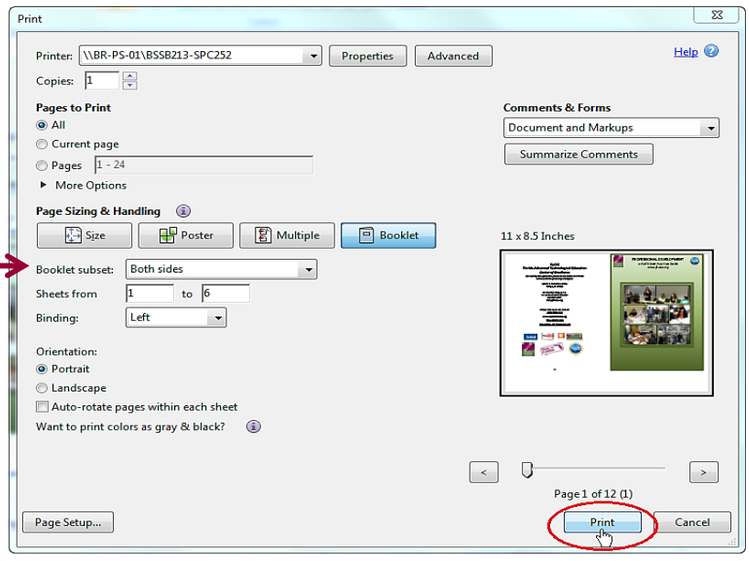
Step 2 – make sure Booklet subset is for Both sides

Step 3 – select Print



Select Booklet

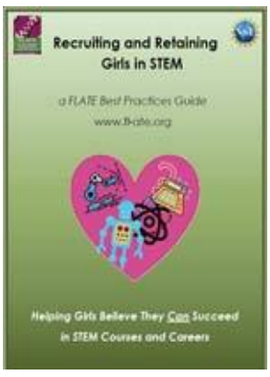
Before selecting Print, make sure that the Booklet subset is for Both Sides.



FLATE Best Practice Guides

All FLATE Best Practice Guides are available as online resources or for download at **fl-ate.org/best-practices**

ET High-Tech Camps for High School Students

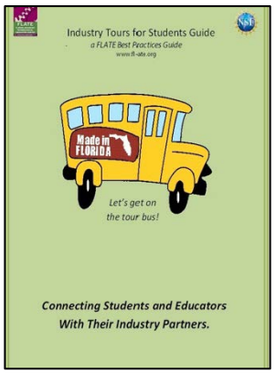


Recruiting & Retaining Girls in STEM

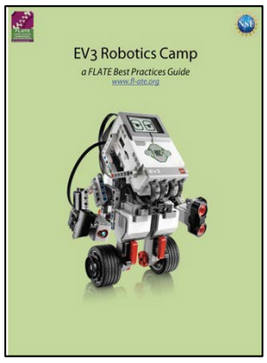
Professional Development

Curriculum Alignment Credentials Guide

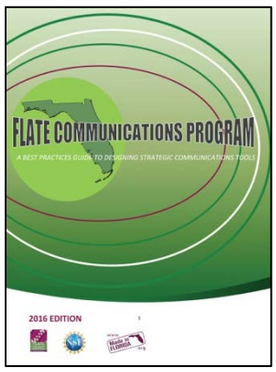
Forging Positive Partnerships in Florida



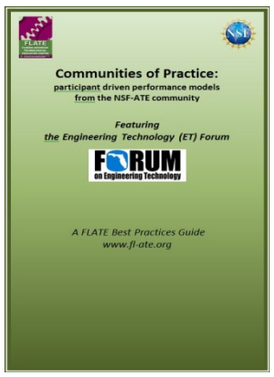
Industry Tours for Students Guide



Robotics Camp Best Practice Guide



FLATE Communication Programs



Communities of Best Practice Guide

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