

ORANGE COUNTY
BOARD OF EDUCATION

AGENDA ITEM ABSTRACT

Meeting Date: February 10, 2014

AGENDA ITEM No. 14-02-09

ACTION: (Y/N) N

SUBJECT: Engineering is Elementary (EiE) Project Report

INFO. CONTACT: Lizette Day/Jayne Bell-Williams/Myron Wilson PHONE: 919-732-3622

ATTACHMENTS: 1. Engineering at Central Elementary School Power Point
2. STEM/EIE Program Update

PURPOSE: To provide the Board of Education a report on the implementation of the theme school at Central Elementary which includes a timeline, budget and current status for the Engineering is Elementary (EiE) program.

BACKGROUND: In the fall of 2011, Orange County Schools began discussing and researching new programs to implement at Central Elementary School. In November 2011, a team from OCS visited Rachel Freeman School of Engineering in Wilmington, NC to observe their school-wide implementation of the Engineering is Elementary program. In December 2011, Elizabeth Parry, an engineering education consultant from NC State, presented to the OCS BOE on engineering in elementary schools. In January 2012 the OCS BOE approved a plan to implement the Engineering is Elementary program as part of a STEM themed school at Central Elementary School. The plan included personnel, marketing, procurement and professional development action items. All action items on this plan were completed.

The 2012-2013 school year was the first year for Central ES as a STEM themed school, and the program continues to grow and develop. Since implementing the EiE program, enrollment has increased by 100 students, the number of students receiving discipline referrals has decreased, and test scores have improved.

The enthusiasm for the STEM focus at Central Elementary School has led C.W. Stanford Middle School to initiate a STEM focus as well. The Board will receive an update on the middle school efforts at a later date.

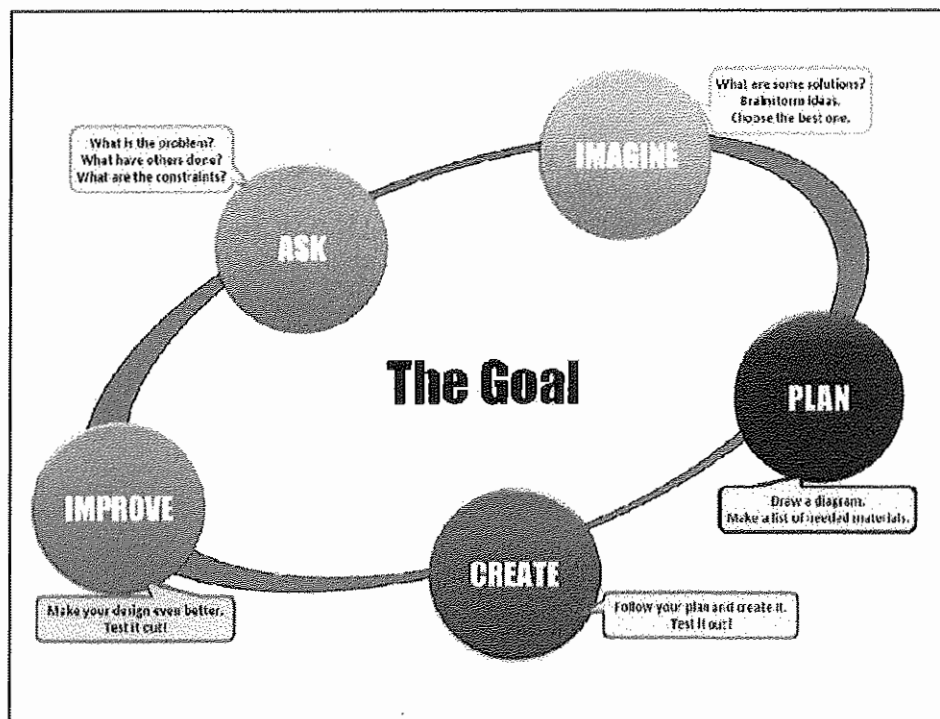
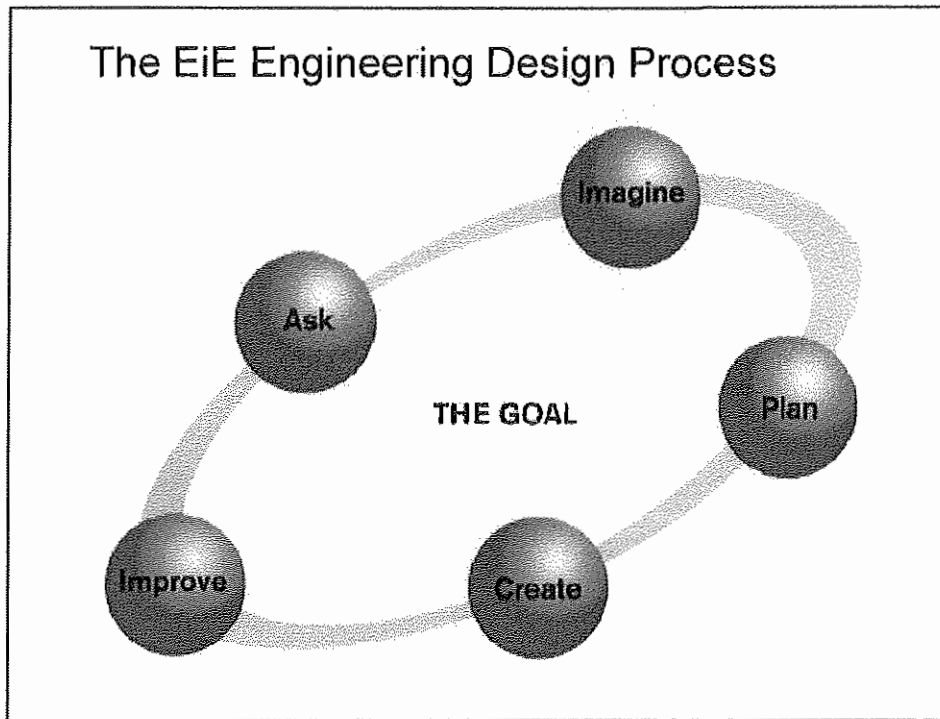
FINANCIAL IMPACT:	STEM Coordinator (Plus benefits)	\$74,099
	Professional Development and Materials for STEM	\$45,957
	Total	\$120,056

RECOMMENDATION: The Superintendent recommends that the Board of Education receive for information the report on the implementation of the theme school at Central Elementary School.

Engineering at Central Elementary School

Central Elementary School

- **Engineering Design Process**
- Professional Development
- Curriculum
- Notebooks
- “Scream the Theme”
- STEM Coordinator
- Partnerships
- Etc.



	Engineering	Reading Comprehension	Writing	Math Word Problems	Scientific Method	Teamwork
ASK	What is the problem? What have others done? What are the constraints?	Why am I reading this? What is the purpose of reading this? What reading skill am I practicing?	What am I writing? What is my purpose?	What could the answer be? What can the answer NOT be? What is the question asking?	What are you trying to solve? What related research exists?	Who is on my team? What talents does each individual have?
IMAGINE	What are some solutions? Brainstorm ideas. Choose the best one.	Visualize your thinking Picture the story in your mind	What am I going to write about? Consider options from a prompt. Picture the story in your mind.	Picture what is happening	What do you think is the answer? (Hypothesis) How can you control the variables? What could you measure?	What are things that need to be done by team members? How can each person contribute? What might prevent the team from working together successfully?
PLAN	Draw a diagram. Make lists of materials you will need.	Prepare for reading: Pick a "just right" book Activate your background knowledge Take a Picture walk	Organize your thinking with a graphic organizer Use an outline	Use CUBES to plan the steps to solve the problem.	Write the procedure step by step. Make a list of materials you will need. Develop a way to collect data.	Assign roles. Outline steps. Determine deadlines.
CREATE	Follow your plan and create it. Test it out!	Read. Connect to what you've read. Respond to the reading.	Write a draft. Draw illustrations.	Solve the problem. Show your work with pictures, words and #s	Conduct the experiment. Collect data.	Complete your role's responsibility. Help others. Meet deadlines
IMPROVE	Talk about what works, what doesn't, and what could work better. Modify your designs to make it better. Test it out!	Re-Read Read more	Revise your writing to make it sound better. Edit spelling and grammar. Share with a reader. Publish using technology	Check your answer. Try another strategy to see if you get the same answer. Write a similar problem.	Analyze data. Draw a conclusion. Revise the experimental procedure. Change a variable.	Talk about what works, what doesn't, and what could work better. Take turns with different roles.



A replicated model...

- Engineering Design Process
- **Professional Development**
- Curriculum
- Notebooks
- “Scream the Theme”
- STEM Coordinator
- Partnerships
- Etc.

Professional Development

- **Foundational skills**
Teamwork, Communication, Science vs. Engineering vs. Technology
- **Instructional Practices**
Workshop Model, 5E, Formative Assessment, Teamwork, Notebooking, Integration, Field Trips
- Engineering curriculum
- Engineering notebooks
- Engineering Habits of Mind
- Integrated Engineering Design Process **

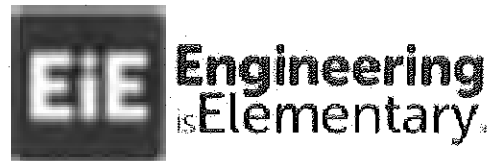


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Engineering Curriculum

- Engineering is Elementary- aligned w/ quarterly science standards
- Engineering Design Challenges
- Assessment
- Correlated field trips



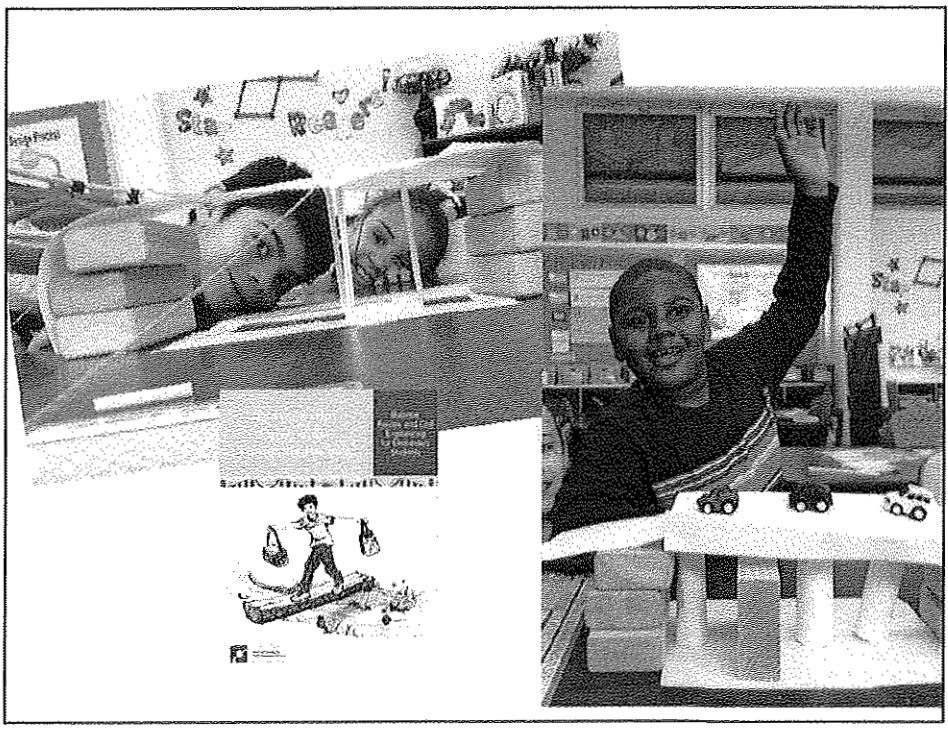
Developed by the Museum of Science, Boston

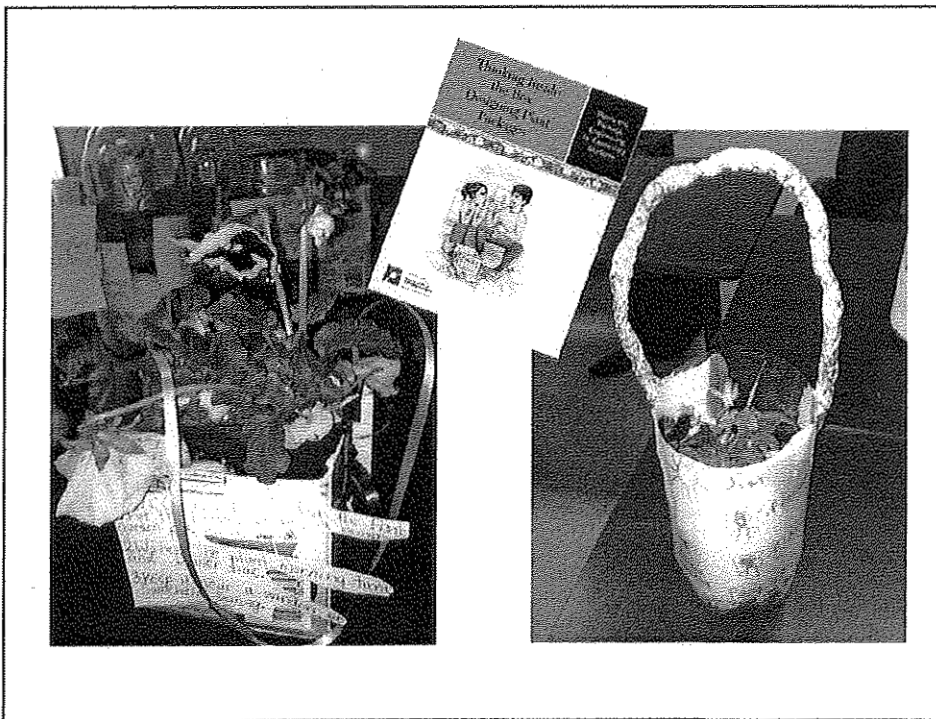


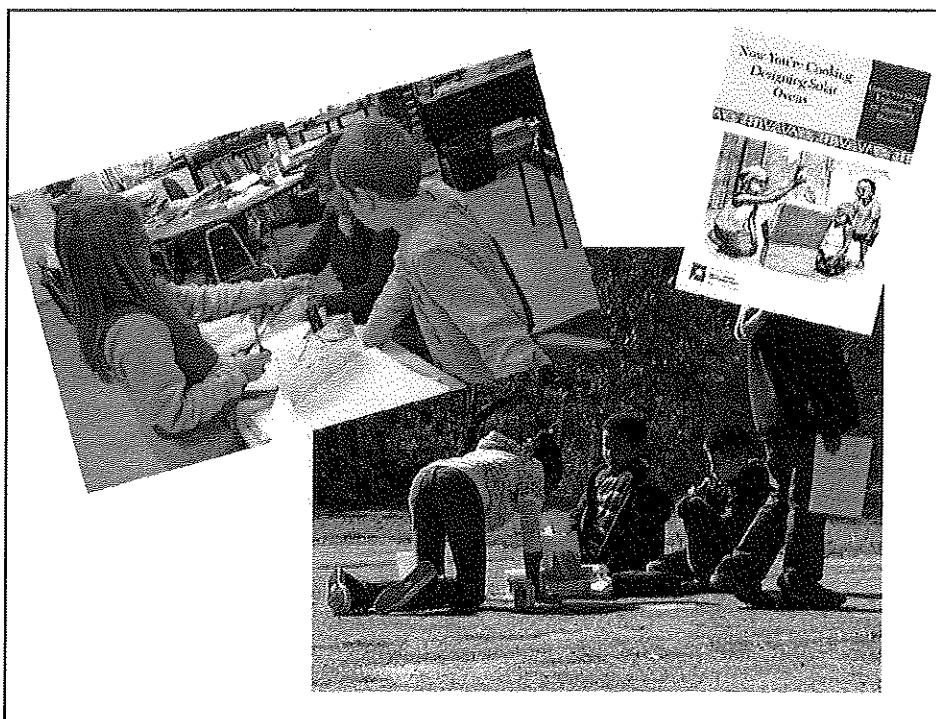
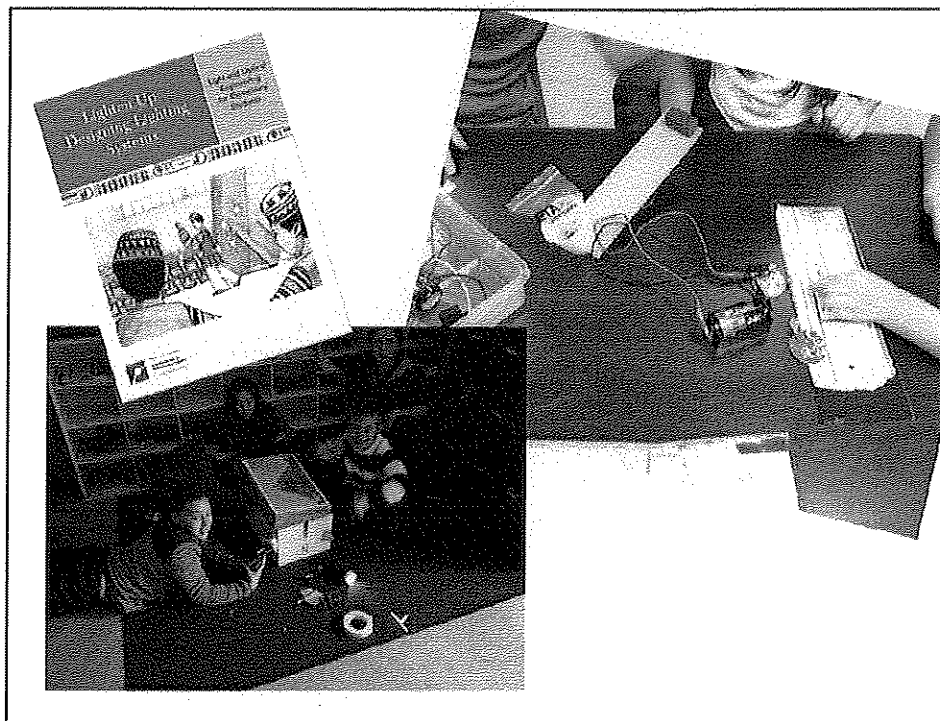
	1 ST NINE WEEKS	2 ND NINE WEEKS	3 RD NINE WEEKS	4 TH NINE WEEKS
NC Essential Standards	K	Weather	Animals	Movement
		Brown's Farm	Alamance Children's Museum	Carrboro Arts - Rainbow Fish
		Moon	Push/Pull	Rocks/Soils
	1		Designing Bridges	Designing Walls
		Downtown Hillsborough Walking Tour	Greensboro Natural Science Ctr	Carrboro Arts - Rainbow Fish
				Museum of Life and Science
	2	Weather	Solids/Liquids	Sound
		Designing Windmills	Improving Dough Process	Designing Musical Instruments
			Marbles	Carrboro Arts - Jabala Arts
	3	Plants/Soils	Matter/Energy	Solar System/ Planet Earth
		Designing Plant Packages Designing Hand Pollinators	ESP	Evaluating a Landscape
		Eno River Ed Center		Moonhead Planetarium
	4	Organisms	Electricity/Magnetism	Rocks
		Designing Model Membranes	Designing Storm Circuits Designing Lighting Systems	Replicating an Artifact
		NC State Fair	Raleigh Capitol	Grandfather Mountain
5	Ecosystems	Weather	Human Body	
	Cleaning an Oil Spill NC Museum of Natural Science	Designing Solar Ovens Carrboro Arts - "Hired Soul"	Force/Motion	
			Making Work Easier Greensboro Civil Rights Museum	

Albion Elementary School

	1 st NINE WEEKS	2 nd NINE WEEKS	3 rd NINE WEEKS	4 th NINE WEEKS
NGSS	K Pushed/Pulls **** Designing Bridges	Weather ****	Plants/Animals	Plants/Animals
	1 Sun/Moon/Stars ****	Plants/Animals *	Plants/Animals Designing Plant Packages	Waves/Light Designing Lighting Systems
	2 Solids/Liquids ** Improving Playdough Process	Earth's Surface Evaluating a Landscape	Pollination/Plants	Pollination/Plants Designing Hand Pollinators
	3 Survival/Fossil/Traits *	Survival/Fossil/Traits Cleaning an Oil Spill	Force and Motion Making Work Easier	Weather and Climate Designing Windmills
	4 Electricity/Magnetism * Designing Alarm Circuits	Plants/Animals Designing Model Membranes	Rocks Replicating an Artifact	Waves
	5 Human Body ****	Ecosystems Cleaning an Oil Spill	Force/Motion Making Work Easier	Weather Designing Solar Ovens



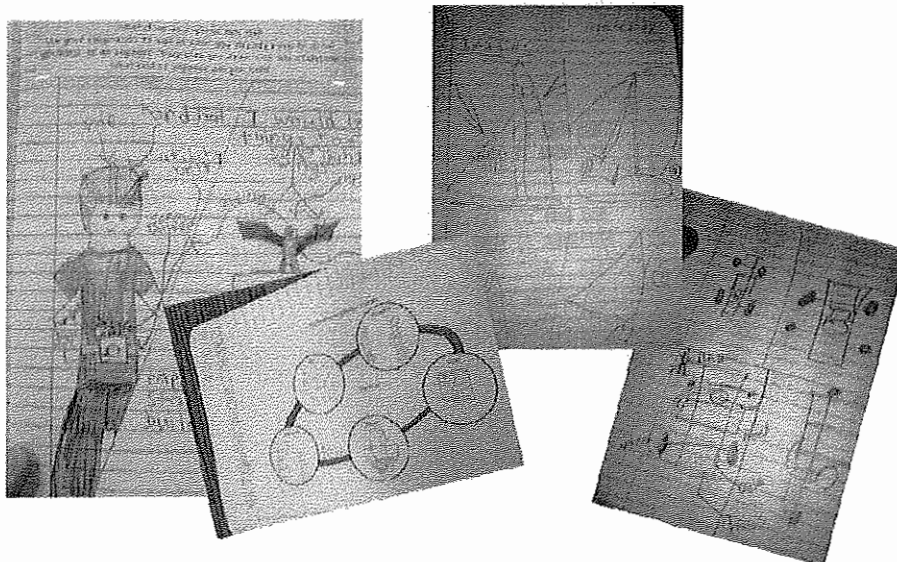




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Engineering Notebooks

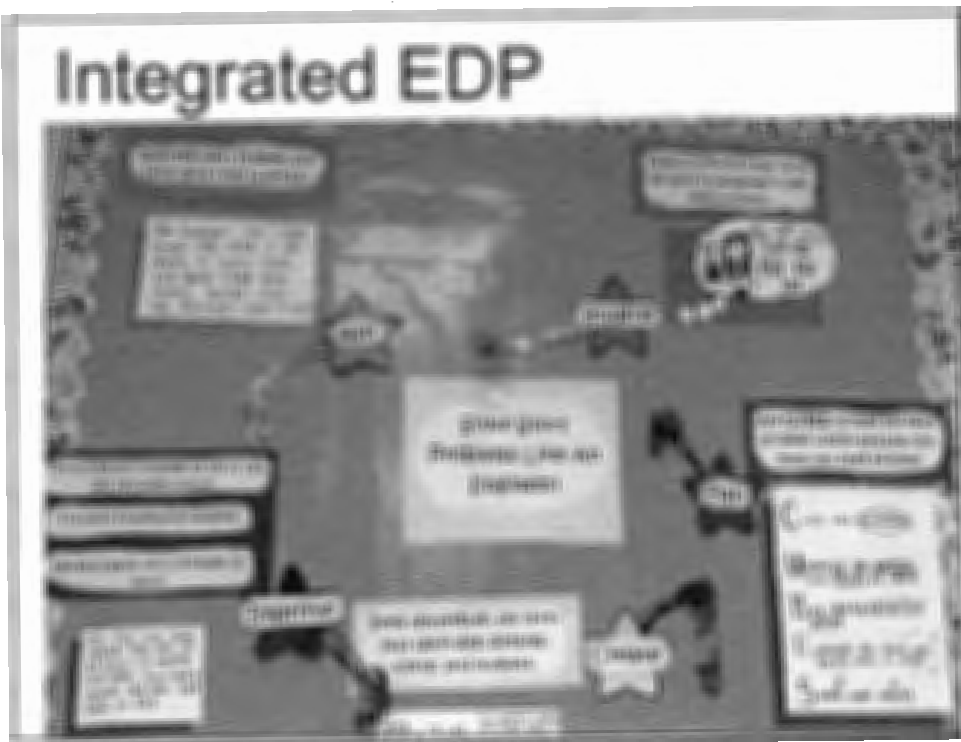
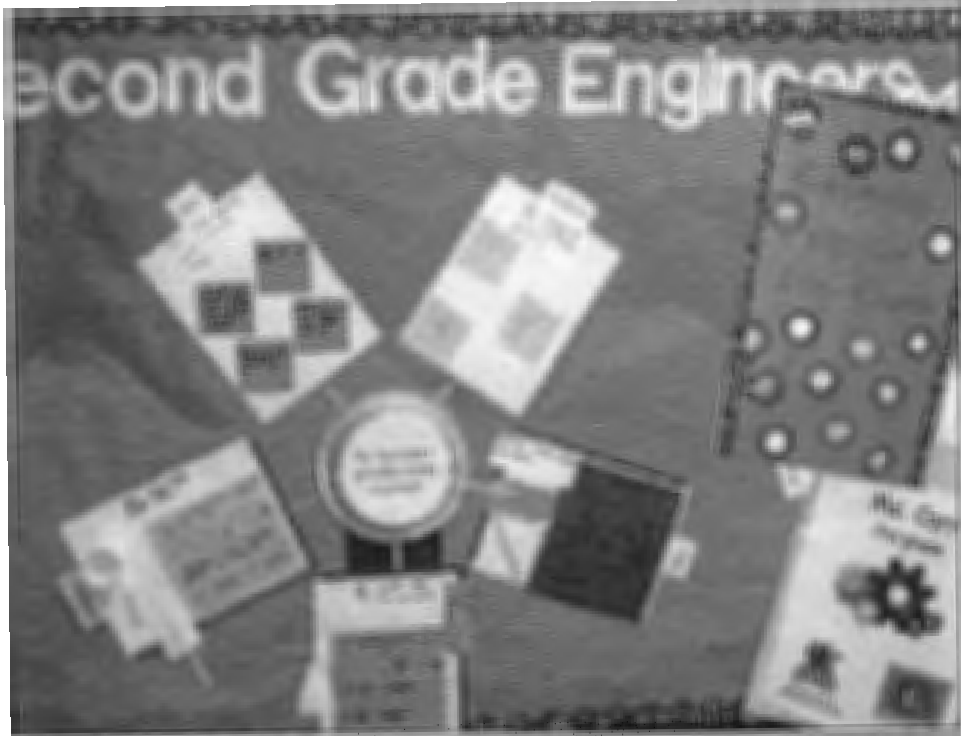


A replicated model...

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Integrated EDP



A replicated model...

- Engineering Design Process
- Professional Development
- Curriculum
- Notebooks
- “Scream the Theme”
- **STEM Coordinator**
- Partnerships
- Etc.

STEM Coordinator Position Description

Work with teachers and staff to implement engineering design principles in every classroom. Support the implementation of STEM notebooks and effective teamwork implementation. Provide support to teachers in lesson planning to ensure effective delivery of integrated STEM lessons addressing the North Carolina Standard Course of Study goals and objectives.

Aid in providing resources for engineering implementation, including obtaining and maintaining Engineering is Elementary curriculum books and kits as specified by grade level, general supply stores and electronic and printed supplemental materials for teachers to implement.

Serve as the instructional leader for integrated STEM using engineering. Provide on-site support and expertise for STEM integration for administration, teachers and students. Develop opportunities to co-teach with teachers in their classrooms to model effective integrated STEM instruction and collaboration.

Serve as a liaison between the staff and administration and the STEM Curriculum consultant, facilitating whole staff and grade level interactions as mutually agreed upon. Lead efforts to “scream the theme” of engineering and integrated STEM throughout the building through displays of student work and projects, STEM themed posters and wall art and the engineering design process.

Engage parents in the school transformation through printed information, Family STEM events and community partnerships.

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- STEM Coordinator
- **Partnerships**
- Etc.

Partners

- Higher Ed
- Business
- Community Organizations



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- Partnerships
- Etc.

All the other stuff...

- Materials acquisition and management
- After school programs
- eWeek
- Family Events
- Guest speakers
- Teams/Competitions
- PR
- Grant writing

Central Elementary School

STEM/EiE Program Update

Curriculum:

2012-2013	2013-2014
15 EiE units completed for grades 1-5	8/14 EiE units completed for grades K-5 3 EiE Units in progress
50 smaller design challenges completed in grades K-5	15 smaller design challenges completed in grades K-5
12 STEM related field trips completed	6 STEM related field trips completed 9 STEM related field trips planned
Engineering Design Process used in design challenges.	Engineering Design Process integrated in all subject areas.
	Expenditures to date: \$5,249.94

Special Projects:

2012-2013	2013-2014
Completed PRISM grant funded solar car STEM activities with all 5 th grade students	Completed 11/17 in class field trips conducted by Science Fun for Everyone.
Competed at Science Olympiad in March 2013; medalled in 6 out of 18 events	Currently working on Science Olympiad team. Tournament date is April 12, 2014.
Held Scholastic Book Fair in November, 2012. Raised \$2000.00 to purchase STEM related books for Media Center.	Held Scholastic Book Fair in October, 2013. Raised \$2000.00 to purchase books for classrooms.
Celebrated National Engineer's Week: hosted 9 visiting engineers for classroom presentations, conducted school wide egg drop competition	Planning National Engineer's week celebration. 1 classroom presentation confirmed. School-wide egg drop competition will be February 21, 2014.
Completed PRISM grant funded light related activities with all 4 th grade students	
Piloted STEM education advocacy kit from the American Society for Engineering Education with 4 th and 5 th graders	

Partnerships:

2012-2013	2013-2014
Established partnership with Duke University Pratt School of Engineering to create an after school Engineering club	Continuing partnership with Duke via after school engineering club and Boeing Fellows program.
Submitted proposal to Summit Engineering to create partnership. One aspect of proposal included professional engineers from Summit "mentoring" Central teachers.	Leaders and Learners

Grants:

2012-2013	2013-2014
Awarded Biogen Idec Foundation Micro-Grants in Science Education for \$1525.00.	Awarded Jupiter Ball scholarship for field trip to Planetarium- admission and transportation.
Submitted NCTIES grant application for \$3,000.00 to create a Kindle home use program at Central.	Awarded NC Museum of History travel grant for 4 th grade field trip.
	Awarded Hands on Science funds from PTO

Presentations:

2012-2013	2013-2014
Presented to parent/teacher group in Chatham County.	Participated as guest Panelist at NC Chamber of Commerce Education Summit 8/1/14.
Presented w/ DPI staff at NC School Counselors Conference in Greensboro, NC November, 2012.	Presented at the NSTA conference in Charlotte, NC October 2013.
Presented at the Scaling STEM National conference in Durham, NC March 12, 2013.	Invited to present at Scaling STEM National conference in Durham, NC February 17-18, 2014.
Hosted 5 school visits (EiE trainer, Granville Co Toler, Chatham County, Stanford MS, June Atkison)	Hosted 2 school visits (principal from NHCS, Granville Co. Butner)
Hosted 3 EiE informational sessions for parents of prospective students	

Professional Development:

2012-2013	2013-2014
Central ES teachers completed 5 days of professional development on teamwork, communication, the engineering design process, design challenges, engineering notebooks	Central ES teachers attended STEM PD presentation by Dr. Sam Houston w/ CW Stanford teachers at Stanford MS.
Follow up training on notebooks 12/6/13	Attended Bridging the Gap BioMedical STEM conference in Raleigh, NC
2 teachers attended NSTA Conference in Atlanta, GA	Attended the NSTA conference in Charlotte, NC
2 teachers attended NCTM conference in Chicago, IL.	
5 teachers attended NCTIES conference in Raleigh, NC	5 teachers will attend NCTIES conference in Raleigh, NC
Attended American Society for Engineering Education K-12 workshop	
Attended the NSF's STEM Smart Workshop	
	Expenditures to date: \$45,956.82