RIDER UNIVERSITY
SELECT
The Science Education and Literacy Center

CONNECT-ED

Professional Development in Science and Mathematics

Summary of CONNECT-ED PLC 3-Year Action Plans: 2008-2011
Goals, Actions and Anticipated Results

What is CONNECT-ED?

Established in 2003, CONNECT-ED (C-E) is a Consortium of 14 central NJ districts/ independent schools, Rider and Princeton Universities, Raritan Valley Community College, and Bristol-Myers Squibb Company dedicated to providing a coherent, sustained *system* of professional development for K-12 teachers of science and math that models the inquiry approach to teaching/learning and is organized around the Big Ideas in science and math.

What is "Big Idea Thinking?"

The **goals** of CONNECT-ED Phase II (2008-2011) are to: 1) establish in all partner districts an infrastructure of Professional Learning Communities (PLCs) aligned with the C-E model, supported by C-E resources, and anchored in leadership training; 2) through PLCs help teachers implement big idea thinking and the inquiry approach in their classroom practice; 3) through PLCs, help districts implement big idea thinking in their district-wide K-12 science programs.

Big Idea Thinking (BIT) is the process of discovering and then using concepts, constructs, abstractions, themes, or generalizations to connect subjects and topics within disciplines (such as science), across disciplines (such as science and social studies), and to students' prior knowledge to help all children learn at deeper, more meaningful levels. **Big Idea Thinking**:

- is an over-arching vision that leads to coherency in learning and teaching concepts
- is closely related to the scientific process and inquiry-based learning
- is an organizing principle for conceptual learning
- focuses on conceptual learning (comprehension, understandings, knowledge, relevance)
- articulates concepts both vertically (from grade to grade) and horizontally (across disciplines); bridges curriculum; threads throughout curriculum
- results in higher level thinking and reflection

What is inquiry-based teaching and learning?

The National Research Council (NRC) in its *National Science Education Standards* (1996) defines it as: Inquiry is a multifaceted activity that involves making observations; posing questions; examining books and other sources of information to see what is already known in light of experimental

evidence; using tools to gather, analyze, and interpret data; proposing answers, explanations, and predictions; and communicating the results. Inquiry requires identification of assumptions, use of critical and logical thinking, and consideration of alternative explanations." (p.23)

What is the relationship among CONNECT-ED Professional Learning Communities (PLCs), student learning in science and math, and bioscience workforce development?

CONNECT-ED PLCs aim to change the way teachers (in particular, HS teachers) teach science. Too often excited students return to the classroom only to have their enthusiasm for careers in science dulled by science teaching that does not engage them in the excitement of the science process. Through CONNECT-ED, we aim to fundamentally shift teachers' perception of science from a static study of facts to a dynamic exploration of scientific phenomena so that they engage their students in observing the world, forming questions about it, proposing explanations, making predictions, gathering and analyzing data, testing hypotheses, drawing conclusions – and asking the next question. The premise is that students truly engaged in science in the classroom are more likely to pursue advanced study in science, which positions them for science careers. Furthermore, the Commission on Mathematics and Science Education's report, *The Opportunity Equation: Transforming Mathematics and Science Education for Citizenship in the Global Economy* (Carnegie Corporation and Institute for Advanced Study, 2009) rightly asserts, "All young Americans should be educated to be "STEM-capable," no matter where they live, what educational path they pursue, or in which field they choose to work."

Landscape of CONNECT-ED PLC Aims, Activity, and Anticipated Results

Consortium District	District Priorities for Science and/or Mathematics (as of 2009)	PLC Goals (supportive of district priorities and BIT)	Strategies 2009-2011 (leading toward goals)	Outcomes and/or Products/Outputs
City of Burlington	To lessen the achievement gap in science and math among the demographic of African American males. Toward this end, teachers and curriculum administrators will learn new strategies to develop curriculum and analyze state test scores, and they will revise the curriculum.	**GOALS**: 1. The PLC Leadership Team and other district members will learn about BIT (Big Idea Thinking) through experiencing BIMs (Big Idea Modules). 2. To enhance teachers' proficiency in curriculum writing and mapping by attending Mc Tighe workshop for curriculum design. 3. To introduce Big Idea Thinking to teachers beyond the PLC by presenting our BIM (Big Idea Module) to teachers district-wide. **BIT in Action Plan:** We plan to educate the district about BIT(Big Idea Thinking) by having them experience BIMs (Big	a. PLC Leadership Team members met weekly to develop the action plan and budget. b. PLC Leadership Team members (Dan and Melissa) will attend the CONNECT-ED Leadership Institute (June 09) to gain further understanding of PLC's and their roles. c. PLC Leadership TEAM experiences our existing life science BIM in condensed format to better understand BIT and prepare them to write curriculum in year 2. A separate day will be devoted to the rest of the district to better their understanding of BIT (Big Idea Thinking) and BIMS (Big Idea Module). Completed by Sept 2009.	a. A 3-year Action Plan with budget help us reach our PLC goal. b. Those involved will gather further understanding of PLC's and their roles. c. The PLC will better understand BIT so that they will be better prepared to write curriculum in year 2. The product will be a revised/ condensed version of our existing full day life science BIM.

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		Idea Modules). They will use these experiences to help them understand the importance of curriculum articulation vertically and horizontally. Once we have completed our curriculum and curriculum mapping, it will reflect particular concept strands and state standards. Teachers will have this finished product to refer to while developing lesson plans.	d. An outside consultant will train the district on the specific template that was chosen in the prior Mc Tighe workshop to best understand curriculum mapping and writing. This district wide workshop will help us choose a district design template for curriculum mapping as well as a usable map. e. Present our BIM to the entire district during a full day workshop to introduce them to Big Idea Thinking. The day will consist of two sessions of a condensed BIM, one in the morning and one in the afternoon. f. The PLC Leadership Team will design a new BIM (work will take about 3 months). g. New PLC members and other staff members will attend an offsite BIM presentation to help immerse new PLC members in BIT. h. New K-12 science curriculum will be written and articulated vertically using Big Ideas as the organizing principle.	d. PLC Leadership Team will understand curriculum mapping and writing to help the district best utilize curriculum mapping to enhance instruction. Product: a district design template for curriculum mapping. e. District will understand the concept of BIT through BIM experiences so they can apply it to curriculum mapping and design. f. New members will understand how to create a BIM and how important BIT is. Product: A new BIM. g. New members will gain further understanding of BIT through BIM experiences. h. We will produce a curriculum map for teachers to follow as well as a new science curriculum that is fully articulated and based on BIT. Teachers will begin to use curriculum and curriculum maps to help reduce the achievement gap among African American male population.
East Windsor Regional School District	East Windsor Regional School District's priority is to improve student achievement. Examining standardized test scores and tracking student growth from	**GOALS**: 1. …**expose at least 20% of ES, MS, and HS teachers who teach math or science (total of 38 teachers) to "Big Idea**	a. Leadership Team Meetings b. Communication w/district	a. Goals and Action Plan b. LT Presentation to ALL District Administrators on CONNECT-ED Phase II

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	year to year beginning with the NJASK3 to the NJASK8 is one way to evaluate gaps in students' learning. Teachers need to work collaboratively to analyze test data to evaluate students' weak areas as well as their strengths.	**Thinking"** through Mini-BIMs, Full Day BIMs, and Round Table Discussions. 2. …**establish a PLC** by having more teachers involved in "Big Idea Thinking" and its connections to student performance in their classes. **BIT in Action Plan:** Our Action Plan itself is designed around the **FERA (Focus, Explore, Reflect, Apply) Learning Cycle**: **T**hrough our workshops and Round Table Discussions, teachers will be encouraged to share their discoveries, their questions, and their impressions about how science education is changing and the implications for student learning in their classrooms. The Leadership Team will utilize themes/Big Ideas from the Atlas for Science Literacy and develop a mini-BIM from grades K-12 on data representations and graphing as it applies to life science. The PLC Leadership team will communicate these math and science connections in their presentation of their Graphing in Life Science mini-BIM to educators in the district. The leadership team will also model the connections across grade levels and to other big ideas in science and math. The leadership team will model the inquiry based instructional approach by presenting a mini-BIM	c. Create A Mini-BIM d. Market the Mini-BIM e. Data Collection f. Present the Mini-BIM g. PLC Training at Rider h. Round Table Discussions i. Present a 6-hour BIM j. Create Workshop (Inquiry / non-Inquiry) k. Market and Present Workshop: "Making the Connection: Applying BIT in Your Classroom"	c. mini-BIM on graphing related to Life Science d. Marketing materials/ BIT visibility e. Pre-survey to be given out to ALL staff to measure understanding of "BIT". f. Mini-BIM workshop + survey/eval form to determine participants' interest in a 6-hour BIM g. additional training h. 20 prior BIM participants participate in BIT Round Table Discussions I 6-hour BIM workshop: content choice dictated by prior survey of teacher interest j. Workshop in which teachers **apply** their understanding of BIT and inquiry by bringing their lessons and discussing **what** needs to changed to address BIT?

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		and providing staff development though hosting another school district's BIM presentation. During our second year of implementation, the leadership team will conduct a follow up workshop to assess teachers' understanding of big idea thinking and inquiry based learning. The staff development will include differentiating between inquiry and non-inquiry based classroom activities in math and science. The leadership team will assess teachers' understanding of inquiry based learning through a culminating needs assessment survey.		
Hamilton Township School District	1. Examine instruction practices K-12 as they relate to science, and align lessons to the newly released NJCCCS for science. 2. Improve student learning through teacher collaboration (including the implementation of professional learning communities) and refining of instruction based on methodology research.	**GOALS:** 1. … **establish a PLC** centered on examining best practices in science instruction that support student learning. PLC members will collaborate to establish **group norms** and a preliminary **action plan**. 2. … a) **examine, discuss and compile resources** of research-based science instruction strategies. ….. b) **formulate a science lesson plan template** that will include the components for effective lessons, taking into consideration Big Idea Thinking, the FERA cycle, and new NJCCCS CPI sequence for science. 3. …a) **reflect** on newly compiled instructional strategies resources **as they create and conduct inquiry-based, grade level specific, science lessons** that address identified	a. Work to form PLC; brainstorm ways to invite other teachers to join the PLC; work on completion of action plan. b. Forming PLC; brainstorm ways to invite other teachers to join the PLC; work on completion of action plan. c. Finalize Action Plan draft; create invitation; discuss Ch 1-3 *Team to Teach* d. Establish agenda for first meeting. Send out invitation. Discuss Ch 4-7 in *Team to Teach* e.Purchase PLC binders for members. f. Meet with entire PLC; define PLC;	a. Develop ideas for action plan; ideas for inviting other teachers to join PLC. b. Clear ideas for PLC structure recorded in meeting minutes. c. Final Action Plan submitted to Rider; Invitation for new PLC members; ideas for first PLC meeting recorded in meeting minutes. d. Tentative first meeting agenda with activities and leadership roles identified, including participant reflection sheet. e. Binders for participants to keep papers from PLC organized. f. An established, informed

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		cumulative progress indicators. …b) **share and refine their lessons through collaboration** with colleagues within the PLC and the district. 4. …**examine their instructional practices** as they evaluate, distribute and refine **additional science lessons** while collaborating with other faculty members on lesson implementation and collaboration across our district. **BIT in Action Plan:** • Involves collaboration of teachers of different grade spans, all focused on one Big Idea in Science while improving their instruction. • Teachers working together to develop a mutually agreed upon science lesson template that incorporates aspects of effective science lessons and Big Idea Thinking. This will include student inquiry-based learning strategies and teacher attention to the FERA model of lesson development. • Built on the premise of learning together and working toward a common goal. • Enlighten teachers across the district as to their role in helping students see the Big Picture in science and how they each play a pivotal role in their students' success.	share action plan; begin to establish norms; discuss goals; articulate vision g. Meet with entire PLC; leaders share BIM lessons they had previously developed. h. Mini BIM presentation i. PLC meeting to discuss PD they feel will be necessary for PLC and individual success j. PD course for educators on establishing an on-line collaboration site k. Book studies on Effective Classroom Strategies for science instruction l. On Line Professional Development Course(s) to increase knowledge base for effective instruction m. Review of the new NJCCCS for science, noting how standard strands are developed vertically and based on Big Ideas in Science. n. Develop lesson plan template that incorporates PD	group excited about being a part of our PLC! g. A PLC informed about BIM model, FERA cycle and importance of vertical articulation h. A PLC familiar with the use of the 'pagoda' and that sees the impact of concept development. i. A plan for individual PD and sharing of information. j. On-line collaboration site for posting and discussing topics that arise in PLC; share developing science lessons and thoughts. k. Discussion & list of effective, practical classroom strategies as they apply to science instruction. l. Discussion of effective classroom strategies that lead to increased student learning; list of recommendations for PLC for effective incorporation of inquiry-based learning m. Awareness of and discussion for changes in science instruction, content and cumulative progress indicators. n. Discussion of effective strategies for lesson planning;

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				science lesson plan template and rubric that focuses on student learning, BIT and incorporates knowledge gained in shared professional development.
			o. Develop grade specific science lessons centered around specific, group agreed upon CPIs/ NJCCCS	o. Discussions centered on focused instruction for the span of grade levels involved; lesson plans for science that address grade level specific NJCCCS.
			p. Articulate, collaborate, and publish specific lesson plans.	p. Articulation within PLC and with colleagues across district; refined and shared grade level specific lesson plans that address agreed upon NJCCCS for science.
			q. Share developed lesson plans with other teachers across the district.	q. A more informed faculty across the district; creating an awareness of BIT and demonstrating the value of professional collaboration; a series of science lessons that address the NJCCCS, inquiry, BIT and that incorporate the FERA model in their development.
			r. Develop more science lessons that address appropriate CPIs and include researched and effective pedagogies.	r. Greater student achievement; more lessons that address the NJCCCS, inquiry, BIT and that incorporate the FERA model in their development.
Hillsborough Township School District	1. Review standardized test scores as well as formative and/or performance assessments in each assessed content area.	**GOALS:** 1. … **facilitate [PLC] teacher learning about big idea thinking** and coherent science curriculum, to **create learning**	a. Meet w/ principals of all schools b. Recruit additional PLC members	a. Principals become aware of goals in science and their role supporting teachers b. increased interest/

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	2. Articulate with district administration and supervisors to determine areas of student strength and opportunities for growth. 3. Develop a curriculum strategic plan with district administration. 4. Implement LEARNIA as a pilot program (K-6) as a benchmark formative assessment tool. 5. Develop action plan strategies to improve test scores on state testing. 6. Investigate internal professional development opportunities. 7. Conduct an analysis of disaggregated groups from NJASK.	**progressions that can drive the creation of BIMs** to serve as the foundation of a coherent science curriculum. 2. …. **science teachers across the district…will design 10 BIMs** to serve as the **foundation of a coherent science curriculum** and be utilized as common educational experiences all students have across the district. 3. … PLC will…**sustain dialogue on best teaching practices in science** education beyond the grant by **shifting the culture around professional development to a collaborative effort** towards a coherent science curriculum that inspires big idea thinking and continuous learning by both the teachers and students. 4. … PLC will **increase by 100% the number of teachers routinely employing big idea thinking in their science instruction** (currently ~ 17 teachers regularly employ big idea thinking in their teaching) **BIT in Action Plan:** The ultimate outcome would be to analyze the current curriculum and provide PD for teachers on effective science instruction and the components of a coherent curriculum prior to our next science curriculum revision, which is due for implementation year 2012-2013:	c. Mini-BIM training for LT, then new members d. Purchase Atlas; Atlas training e. CTS training f. Create CTS CEU (26-hr. course for teachers) for Summer Science Institute g. Purchase *Protocols for Professional Learning*; use in PLC h. Create Starfish logo wear for recognition and incentive i. Create BIM CEU (26-hr. course) for Summer Science Institute j. Create formative assessments (Learnia) k. Analyze NJASK and EOC Bio test	awareness in each bldg.; additional BIM Trainer c. Mini-BIM training protocol & documentation; LT experienced in BIT and capable of Mini-BIM training; application of BIT to at least one new Mini-BIM d. Atlas training protocol and documentation; teachers trained to use Atlas; learning progressions ID-ed for BIM design e. CTS training protocol & documentation; teachers trained in CTS; application of CTS/BIT to learning progressions for district science curriculum f. Teachers trained in CTS; broader application of CTS/BIT to instructional planning g. PLC familiar with strategies that facilitate their work h. incentive; recognition; visibility for the work i. PD in BIT for 175 teachers; new Mini-BIMS aligned w/district science curriculum J Science formative assessments and resulting data for analysis k. Data analysis and action plan to improve test scores

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		K-12: • **identify big ideas and organize K-12 curriculum vertically around them;** • **eliminate concepts not part of big ideas…;** • **identify common core assessments that focus on big ideas of units to gather data on student learning, with common rubric for assessment;** • **BIM creation to promote inquiry, big idea thinking and improved science discussion;** • **identify common order of implementation of the curriculum;** • **create consistency across the science curriculum.** Additional grade level goals include: • K-4 – INQUIRY training; writing in science – the use of data/evidence to justify answers; identifying literacy resources for integration • Grade 5-8 – INQUIRY training (5-8); vertical articulation of units that build/overlap; scaffolding science process skills and expectations of students; easing transition; interactive science notebooks/scaffolding note taking/study skills; writing a conclusion • Grade 9-12 – easing transition; scaffolding science process skills and expectations of students; writing in science –	data I. Recruit additional PLC members (aim to expand to all 9 schools)	I. increased awareness and teacher participation

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		the use of data/evidence to justify answers, research		
Hopewell Valley Regional Schools	Science instruction should include inquiry and hands-on activities when possible. We are presently in the third year of a revised K-5 curriculum. Integration of subjects in the elementary schools is viewed as positive as it reinforces skills and learning.	**GOALS:** 1. …. **80% of students in classes of PLC members will increase proficiency in observations and reflections** as measured with a district-developed rubric and pre- and post- assessment. 2. …. **80% of members of the PLCs will describe the use of notebooks in science as beneficial to student learning and as an instructional strategy that will be incorporated into lesson design on a long term basis**. This will be determined by a survey. 3. …. the Leadership Team will share their findings with interested K-12 staff through a **ten hour professional development course** to be offered after school in two hour sessions. 4. …. **2011 PLCs at the elementary level will increase** to include other interested teachers and the Leadership Team will **develop and present a BIM to the PLCs**. **BIT in Action Plan:** Research has shown that students who record observations, ideas, wonderings, and reflections retain information and understand concepts more effectively than those who don't.* By providing	a The Leadership Team will: • Read articles and books related to the Big Idea. • Try techniques in our classrooms. Meet monthly to discuss readings and class experiences. b. None of our members have ever designed a BIM. To fill that gap: Attend CONNECT-ED Leadership Training, BIM Workshops, Train the Trainer, and other opportunities c. Leadership Team will visit Middle and High School classrooms d. …develop pre- and post- student assessments and construct the teacher survey. e. Attend the New Jersey Science Convention in October f. Purchase materials for PLC members to use as reference	a. … gather resources to use in PLCs next year. Produce a list of these resources which will include relevant book titles, articles, and websites. b, …become acquainted with the process of designing and presenting a BIM. c. …learn how concepts are explained at different levels in order to better plan a BIM. d. Pre- and Post- Assessments will be administered in the classes of PLC members in 9/09 and again in 6/10. Results will allow us to evaluate progress towards goal 1. A teacher survey will be administered in June 2010 to PLC members to assess progress towards achieving goal 2. e. … learn about the use of science notebooks in elementary classrooms to reinforce student learning. This information will be shared with PLC members upon return to school. f. PLC members will read about writing in science class and then try techniques in

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		teachers with opportunities to learn about techniques involving notebooks and implementing their use in the classroom, students will benefit at all levels. Students make connections and learn more deeply when required to reflect and connect learning with prior knowledge. By making these connections students (and teachers) will use Big Idea Thinking to structure their understanding of the natural world and science phenomena they can observe. By modeling this thinking we hope that teachers can instill in students the habit of looking for connections in all of their learning. We will address the strand "Scientific Literacy: Evidence and Reasoning in Inquiry" on page 17 of the <u>Atlas of Scientific Literacy, Volume 1</u>. *References include "Science Notebooks: Writing About Inquiry" by Brian Campbell and Lori Fulton, Heinemann, 2003 and "Using Science Notebooks in Elementary Classrooms" by Michael P. Klentschy, NSTA Press, 2008	g. Attend the National Science Convention in Philadelphia h. Work on BIM design i. Offer a district-wide PDAC course called "Thinking and Writing Like a Scientist" j. Purchase materials for PLC members to use as reference	class and report on results to the PLC at meetings every two weeks. g. … learn more about the use of science notebooks in elementary classrooms… Information will be shared with PLC members upon return to school. h. New BIM: "Thinking and Writing Like a Scientist" i. … train district teachers who are not members of our PLCs in the techniques we have learned to increase student understanding and retention of concepts and information. j. PLC members will read about writing in science class and then try techniques in class and report on results to the PLC group at meetings every two weeks.
Montgomery Township School District	**Within the context of the Montgomery Township District Assessment of Great Teaching:** Goal 1c: Improve consistency in quality of instruction and curricular effectiveness Goal 2d: Establish a shared	**GOALS**: 1. Establish conditions that are conducive for PLC's to function effectively. 2. Understand what constitutes "great teaching and learning" as defined by the district. 3. Make connections between Big Idea thinking and great teaching and learning.	a. Invite teachers to join a formalized professional learning community with the goal of developing the understanding of what is "great teaching and learning." b. Collaborate with Montgomery Township's local professional	a. Generate interest among teachers to further develop their understanding about what makes great teaching and learning. Formulate school wide small PLC teams with four teachers per team. b. Communication directly between PLC and district PD

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	vision for teaching and learning Goal 2d Subset: Implement professional development model: Instruction and learning, Application and Feedback	**BIT in Action Plan:** Our plan will advance Big Idea Thinking by one or more of the following: • Elementary, middle and high school teachers will experience a Big Idea Module. • Engage in cross grade level discourse with colleagues with a focus on connections between big ideas. • High school, middle school, and elementary teachers will attend science proficiencies workshops on Big Idea Thinking. • Teachers in elementary, middle, and high schools will be invited to participate in a series of professional development workshops that focus on linking concepts and context.	development committee. c. Science Proficiencies Workshop at Montgomery HS on Big Idea Thinking d. Cross Grade Level Collaboration for teachers from Montgomery High School e. PLC Leadership Team will take part in professional learning outside the school district (NCTM, NCSM Conferences) f. Teachers will engage in acquiring content and pedagogical knowledge through one or more of the following: book study group, case study analysis, or discussion of research based journal articles.	committee to share vision, mission, ideas, and action plan. c. Inquiry workshop at Montgomery High School for up to 25 participants. Teachers will get to participate in a Big Idea Model (BIMS) and begin to grasp the concept of Big Idea Thinking. is Big Idea Thinking?" d. Collaborate cross grade level with other schools in the district to examine instruction and focus on best teaching practices. <u>Product:</u> Develop list of best practices observed and compare to Montgomery Township District Assessment of Great Teaching. Share list with colleagues. e. Understanding of and experience with linking concepts and context; to be shared with colleagues district-wide through workshops in summer 2010. f. Identifying key elements of research and connecting them to needs in the classroom. Conduct discussions on the implementations and results to improve student learning. <u>Product:</u> a guide of all the key elements that were developed through research that can be used with PLC's.

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			g. Professional Development Workshops	g. Dissemination of research & strategies gained from NCTM and NCSM conferences.
			h. Facilitation of PLC's in the Elementary School Setting	h. Support structures for professional learning teams by assisting in team logistics, setting up team goals and defining team expectations.
			i. Professional Development on PLC's with new staff members at the New Teacher Academy	i. The foundation for professional learning teams: teachers will learn research-based rationale for working on collaborative teams, help teachers identify the benefits of collaborations for themselves and their colleagues, and build enthusiasm for participating in professional learning teams.
			j. Facilitation of PLC's in the Middle School Setting	j. Build the foundation for professional learning teams by providing teachers with research-based rationale for working on collaborative teams, help teachers identify the benefits of collaborations for themselves and their colleagues, and build enthusiasm for participating in professional learning teams.
			k. Contact other districts to schedule Cross District Collaboration meetings and observations of peers from another district comparable to Montgomery Township.	k. Cross-pollination of ideas and sharing of knowledge of best practices & big idea thinking. Sharing of strategies to address student learning challenges
			l. Science Proficiencies Workshop on Big Idea Thinking	l. Deepen understanding of inquiry-based learning and

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				teaching. Engage teachers in conversations that spur thinking about best practices in teaching and learning. Teachers will engage in discussions of essential questions which lead to Big Idea Thinking and the development of conceptual understanding.
			m. Science Proficiencies Workshop on Big Idea Thinking	m. Teachers will expand their knowledge of inquiry based learning and engage in discussions of essential questions which lead to Big Idea Thinking and the development of conceptual understanding.
			n. Cross Grade Level Collaboration for teachers from Montgomery Lower Middle School	n. A schedule which allows for the peer-observation of mathematics lessons targeting a specific best teaching practice.
			o. Cross Grade Level Collaboration for teachers from Orchard Hill Elementary School	o. Teachers reflect on best teaching practices with regard to essential questioning and with respect to the Montgomery Township District Assessment of Great Teaching.
			p. Planning Committee will discuss the vision and goals, schedule professional development, share with peers	p. Long range planning for action plan and necessary revisions.
Newgrange School	1. Develop a curriculum for each grade level based on the NJ CCCS, graduation requirements, and the Atlas For Science Literacy that	**GOALS:** 1. To develop a written curriculum for each grade level based on the NJ CCCS, graduation requirements and the Atlas	a.Attend the National Science Resource Center Strategic Planning Institute and develop a strategic plan for revising the science curriculum and incorporating Big Idea Themes	a. A comprehensive strategic plan will be completed by end of July 2009

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	incorporates " Big Idea Thinking" (BIT) and an inquiry- based approach. 2. To help teachers, teacher leaders, administration, and community representatives develop the knowledge and skills needed to implement the strategic plan. 3. To develop assessment methods for the evaluation of student learning and program effectiveness and to use the data for planning purposes at the classroom and program level. 4. Teachers will have access to science instructional materials related to our core curriculum content standards and "Big Idea" themes, as well as literacy materials related to the science content. 5. To develop and maintain support for this strategic plan.	2. The Professional Learning Community Leadership Team (PLC) will develop knowledge and skills to help support the implementation of this strategic plan. 3. Teachers will develop expertise in science content and in the use of inquiry-based instruction. 4. Key stakeholders (Board, Administration, Parent Advisory Council) will have the knowledge and skills to support this strategic plan. 5. Assessment: Develop grade level assessments, which evaluate student acquisition of science content and the use of inquiry. Develop appropriate assessment methods to measure the implementation and effectiveness of the science program. Key stakeholders will use assessment data for program improvement purposes. 6. To have a science instructional materials and literacy library accessible to teachers. 7. Make key stakeholders aware of the strategic plan and the goals of the science program. **BIT in Action Plan:** The vision we have for our science program is that within 5 years all of our science teachers will be well-versed in Big Idea Thinking and the use of inquiry-based instruction. BIT and inquiry-based instruction will be at the core of our science program. There will be clear	and inquiry-based instruction into the science program. b. Develop written curriculum for each grade level c. Organize curriculum around Big Idea themes. d. PLC Leadership Team will prepare a professional development plan/schedule for 2009-10 and future years. e. PLC Leadership Team members will receive 'train-the-trainer' instruction related to inquiry-based instruction. f. Teachers will develop expertise in science content and the use of inquiry-based instruction. g. PLC Leadership team will provide training to science teachers in Big Idea Thinking and the development/implementation of Big Idea Modules h. Information will be provided to key stakeholders about this strategic plan and the value of Big Idea Thinking	b. Written curriculum for each grade level/grade cluster (K-2, 3-4, 5-6, 7-8) and high school science courses c. A vertical articulated curriculum based on big Idea themes. 2-3 themes will be developed each year. d. A schedule for professional development for the 2009-10 school year will be presented to administration for approval by end of September 2009. e. 2 members of the PLC Leadership Team will be able to provide training to other science teachers on the use of inquiry-based instruction and the use of science instructional materials (eg, kits). f. Teachers with expertise to provide an inquiry-based science instruction program that incorporate BIT, and who will be aware of a variety of science instructional materials. g. All science teachers will have an understanding of big Idea Thinking and will be able to incorporate this into their instructional planning h. Key stakeholders will be able to support the implementation of this strategic

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		evidence of this in our curriculum, instructional program and assessment of student learning. Our professional development goals focus on enhancing teachers' science content knowledge, developing inquiry-based instructional skills, and understanding the Big Idea themes embedded in the curriculum. After getting the curriculum and instruction pieces in place, we need to explore how to assess student knowledge and skills related to Big Ideas and the use of inquiry. There is research that shows BIT and inquiry-based instruction are effective and improve student learning. We will be attempting to educate key stakeholders of the value of these approaches.	and inquiry-based instruction i. Develop rubrics and other assessment tools for evaluating student acquisition of science content and student use of inquiry j. Develop methods for assessing implementation and effectiveness of science program k. A resource list of science instructional materials and related literacy materials will be developed l. Keep key stakeholders informed about the action plan and effectiveness of science program	plan i.Teachers will have appropriate assessment tools for measuring pupil progress j. The school will have an appropriate method for evaluating the effectiveness of the science program. Evaluation data will be used for program improvement purposes k. A resource list of materials related to the curriculum, Big Idea Themes and inquiry based instruction will be available to teachers l. Key stakeholders will maintain support for this action plan
Robbinsville School District	The Robbinsville Board of Education mandated that a Math Review Committee be formed to assess the current curriculum and make recommendations for improvement. The main recommendation from the committee was to develop a coherent and consistent math program that incorporates differentiated instruction, varied assessment strategies and remediation and also aligns to the New Jersey Core Content Standards.	**GOALS:** 1. By utilizing benchmark assessments developed by the PLC groups, the math proficiency at each grade level will increase by 5% over the next three years (NJ ASK data, HSPA data). 2. Because of professional development on differentiated instruction and assessment by the PLC groups, the mathematical proficiency of the special education population will increase by 5% over the next three years (NJ ASK data, HSPA). 3. Develop vertical and horizontal articulation through curriculum	a. To develop essential questions for mathematics at the elementary, middle and high school levels. b. Begin a weekly book club where participants (PLC group, administrators, and grade level team leaders) read <u>Schooling by Design, Mission, Action and Achievement</u> by Grant Wiggins. c. Review current curriculum guides and evaluate the documents. Look for gaps and repetitive material. Begin to develop a math atlas through curriculum mapping. PLC group will	a. The group will develop the big ideas, using the NCTM focal points, which will be the foundation for the rest of the initiative b. Deeper understanding of best practices, such as understanding by design, and how to apply them to the Robbinsville School District. <u>Product</u>: Action plan for the district based on the book. c. a district math atlas that incorporates the standards.

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		mapping. **BIT in Action Plan:** Our goal is to help all students conceptualize math. The team will use the NCTM focal points to establish essential questions for the elementary, middle and high school math courses. These essential questions will be the foundation for the curriculum mapping, grade level benchmarks and assessment strategies.	revise curriculum. d. Develop grade level benchmarks and assessments based on the standards (2 representatives from each school will develop these). e. CONNECT-ED PLC Leadership Training f. Send one teacher to CONNECT-ED/QUEST Summer Institute g. Hire a consultant/workshop presenter for the staff in-service day. Topic: differentiated instruction/ curriculum mapping for high school math and science (audience – PLC group) h. Purchase supplemental and enrichment material for the classroom teachers. i. Teacher who attended CONNECT-ED QUEST will present information about big ideas to math and science teachers j. On-going professional development for teachers	d. Benchmarks and assessment tools for each grade level (based on math atlas). e. Teachers will receive further training on Big Ideas Thinking. f. Teacher will turnkey training and information at workshop during October 2009 in-service day. g. A resource packet from the presentation that could be used in classrooms. h. Teacher access to all materials (workbooks, manipulatives, computer software) necessary for meeting the needs of their students. More teachers district-wide with a deeper understanding of big idea thinking to help them understand a better approach to teach mathematics j. Peer coaching, grade level meetings, peer observations, administrative observations, in-district and out-of-district workshops will be components of professional development.
South Brunswick	To promote science content knowledge, curriculum mapping	**GOALS**: 1. …D**evelop a Science PLC** …	a. Elementary Science Feedback Forum	a. details on direction/needs of teachers/admins in K-5.

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Schools	and coherency, and inquiry instruction in our K-5 classrooms.	that will learn to work effectively as a PLC to develop curriculum, district science professional development, and G & T opportunities. 2. Using the Teacher Knowledge & Attitudinal Survey developed in 2009…, **increase elementary teachers' science content knowledge**… to promote comfort and skill in teaching science. 3. **…finalize K-5 science curriculum** using Big Idea Thinking, Understanding by Design, vertical articulation, and the 09 Science Standards…. 4. **…create a Curriculum Map for each unit** at each grade level … which traces the scaffolded learning across the K-8 continuum. **BIT in Action Plan:** Our plan is designed to involve an in-depth evaluation of our science curriculum, with a focus on conceptual connections across the grade levels and embedding inquiry lessons into the teaching that is happening in the classrooms. Along with building a strong curriculum, we want to design curriculum maps (like the AAAS "Atlas for Science Literacy") for each grade level which outline the direct connections between the learnings at each grade level so that teachers become less isolated in their teaching, and can explicitly see the connections among the concepts taught in each grade. We	b. Elementary Curriculum Meeting c. Develop PLC Action Plan d. High School visitation e. Middle School visitation f. Develop/administer survey to ~ gather teacher knowledge and attitudinal data g. PLC Book Study: *Team to Teach* h. PLC Summer Leadership Institute at Rider i. Gather General District Data for Science j. PLC Leadership Team Meeting – Planning Session – Using knowledge gained from book study and data available, Leadership Team will prepare for Data Analysis Session k. convene PLC to analyze data and revise action plan as needed l. Content Training by Middle and High School Teachers for Elementary Teachers connected curriculum units of study m. January PLC Institute	b. 3 Year PD Plan c. 3-Year PLC Action Plan d. names of interested high school teachers for PLC e. names of interested middle school teachers for PLC f. 3 Survey Monkey Surveys (ES, MS, HS) g. knowledge to support the action plan and PLC h. CONNECT-ED PLC training i. District Science Data Database j. Two days of PD planned for Data Analysis session k. Areas of Strength, Areas of need; Action Plan will be adjusted; information will inform district practices l. 1 content workshop, led by one HS and one elementary teacher for elementary classroom teachers m. CONNECT-ED PLC training

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		also believe that elementary science teachers, as generalists, often are not comfortable teaching science due to the complex concepts involved. By providing content training and helping them to see the "big picture," they should be better prepared to teach even the most elementary concepts to their students.	n. Revise K-5 Curriculum to align with 2009 Standards and focus on inquiry o. PLC Quarterly meetings/trainings Topics: G&T opportunities K-12 for students; other p. PLC Leadership Team Training at Rider q. PLC Reflection	n. Realigned K-5 Science curriculum, tied to new NJCCCS and inquiry teaching
Trenton Public Schools	• Writing Across the Curriculum • Applying Math Concepts to Problem Solve in New Situations • Investigating and Exploring Science Using the Scientific Method	**GOALS:** By 2011 the CONNECT-ED PLC members will demonstrate understanding & application of: 1. Year 1 & 2: Inquiry-Based learning in Math & Science for instruction with a focus on Measurement. 2. Year 2 & 3: Inquiry-Based learning in Math & Science for instruction with a focus on Data Analysis. **BIT in Action Plan:** BIT will be incorporated into several facets of our action plan. Our [focus] will be to train teachers to utilize an Inquiry-Based learning approach to teach math concepts in the areas of measurement and data analysis. For instance, we plan to involve the expanded PLC in Inquiry-Based learning through their involvement in the design and preparation mini-BIMs. The mini-BIMs will be developed by groups of four to six team members with varying teaching and grade-level backgrounds. This will allow for vertical articulation throughout	a. Research "Inquiry Based Learning" b. Meet with an Inquiry-Based learning expert from NJ DOE (Lisa Solomose) c. Summer planning meeting with the Leadership Team. The team will produce the agenda and materials for the summer workshop with the expanded PLC d. Provide professional development on Inquiry-Based Learning. The teachers will gain an understanding of Big Idea Thinking and Inquiry-Based methods of instruction as they apply to the concept of measurement. e. Meet with expanded PLC Team to refine their draft mini-BIMs (Measurement). This will be done in	a. Deeper knowledge of the pedagogy of and practices used in Inquiry-Based Learning. **Product:** a literature review and presentation to the expanded PLC. b. A common understanding of Inquiry-Based Learning as it applies to Math & Science. c. Develop an agenda and activities for the Inquiry-Based Learning Institute I. d. The expanded PLC will become more knowledgeable of Big Idea Thinking and Inquiry Based Learning as it applies to measurement. <u>Product</u>: Math mini-BIMs on measurement throughout multiple grade levels e. Further refinement and revision of the draft mini-BIMs (Measurement) created during

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		select elementary, middle, and high school classrooms and will encourage the use of BIT… The strategy is to introduce Inquiry-Based instructional practices in the participant's classrooms specifically focused on the strands of measurement and data analysis with the hope of infusing inquiry-based learning into numerous schools. Teachers in the expanded PLC will create, revise, implement and reflect on mini-BIMs during their involvement in a 2 day summer workshop, numerous follow-up meetings and work sessions. The expanded PLC will discover ways to create connections between various lessons focused on measurement (year 1) and data analysis (year 2) using an Inquiry Based approach. The concepts of measurement and data analysis are simply vehicles to teach the process of Inquiry-Based learning.	preparation for the implementation of the activities contained within the mini-BIM in the classroom. f. Meet with expanded PLC Team to allow for reflection on the usage of individual activities contained within the Measurement mini-BIMs created by the various teams. g. Winter meeting with expanded PLC teachers. Participants will first reflect on lessons learned during the creation and implementation of Measurement mini-BIMs. They will begin creating a draft Data Analysis mini-BIM using an Inquiry approach. h. Spring meeting with expanded PLC teachers. Participants will refine their draft Data Analysis mini-BIMs in preparation for implementing inquiry-based activities in the classroom.	the summer institute. This will allow for the lessons contained in the module to be implemented in select classrooms. f. Analyze the successes, challenges, and implementation of the lessons/ activities contained in the Measurement mini-BIMs in each grade band to further improve their quality and support of the big idea. g. Deeper understanding of Inquiry-Based Learning and application of that to drafting new mini-BIMs on the concept of Data Analysis. P**roduct:** Data Analysis mini-BIMs (draft). h. Refined and revised Data Analysis mini-BIMs. This will allow for the lessons contained in them to be implemented in classrooms.
Watchung Hills Regional High School		**GOALS:** 1. Infuse inquiry-based instruction and Big Idea Thinking throughout the science curriculum. 2. Identify the best curricular materials for our students by evaluating data from student assessments. 3. Carve out meeting time for our professional learning communities embedded in the regular school day by creating a teacher schedule that has	a. Work with school administration as they develop teaching schedule. All science teachers will be scheduled to have shared prep time with course teams b. Meet 2 hours / month in mini-PLCs during common prep time and department meetings to work on inquiry lessons and authentic assessments	a. Common planning time for all HS science teachers. Meetings with course teams during the common prep time will be used to … create inquiry lessons and authentic assessments with BIT b. Course teams will have common time to work together on curriculum that is inquiry based and incorporates BIT, as well as authentic assessments; a library of

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		common planning time for teachers on a course team /mini-PLC). **BIT in Action Plan:** A recent proposed standards revision, by the State, has resulted in compacting the Science Standards, indicating a renewed focus on Big Ideas. Our goals for implementing BIT will occur in stages. Currently, teachers in the science department are organized into course teams/mini PLCs. These teams work together on sharing resources, designing curriculum, preparing for labs, and analyzing student achievement data on exams and state tests. Initially, with a common planning time, course teams/mini PLCs will develop lessons that have BIT within the subject area or grade level. Future lesson plan development in Year 3 will happen through department articulation meetings with other course teachers to identify unifying themes in BIT across biology, chemistry and physics. Throughout the three years of the grant, the *Project 2061 Atlas for Science Literacy* will be used as a resource for making horizontal and vertical connections in the newly developed lessons and curriculum. The science department has already been introduced to the BIT approach. Our teachers experienced training during our October school wide professional development day. Kathy Browne of	c. Train teachers in CONNECT-ED model so that they can train the department during articulation or common prep time meetings d. During common prep time, train teachers how to utilize mini BIMs e. Provide teachers access to training and resources on backwards design for developing BIT lessons, including a copy of *Understanding by Design* for each teacher f. Analyze student work to assess impact of mini PLC/curriculum development	lessons and authentic assessments (1 per teacher, per year, per course) that will be stored in a library on our Atlas Curriculum Map (a shared resource for the entire school) to be used in future years by the course team c. PLC leadership team members with CONNECT-ED experience will work with the rest of the staff to develop inquiry based lessons that incorporate BIT; training materials in CONNECT ED d. Science teachers (all) experienced in developing mini-BIMs as an example of BIT inquiry lesson; Mini-BIM training materials e. Teachers trained in backward design and BIT; Inquiry lessons and authentic assessment with BIT f. Teachers with a better understanding of how students respond to inquiry based lessons and student assessment; revised and improved inquiry lessons and authentic assessment with BIT

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		Rider University, Vicky Pilitsis and Georgia Fisanick worked with the regional high school and the four sending districts to show how BIT could be incorporated vertically through curriculum. We will continue to provide professional learning opportunities in BIT to the science department teachers (as well as sending districts through articulation meetings if possible). Along with the articulation among our mini PLCs, we will extend this articulation to the mathematics department. This is a high priority because the mathematics department has recently re-sequenced its curriculum and the science department is interested in sequencing learning events in a just in time fashion. Just in time is a technique that ensures that math instruction is aligned to and occurs with science instruction. Furthermore, Vicky Pilitsis, Georgia Fisanick, and Drew Williams have given two 1.5 hour workshops offered to all high school teachers on developing BIT and developing essential questions. As part of our approach to fulfilling goal 1 we will continue to provide opportunities for learning about BIT coupled with the principles of Understanding by Design. Vicky Pilitsis has attended training in mini big idea modules. She will be training the core PLC members as an action towards goal 1. Core PLC members will extend this		

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		training to the remaining staff in the science department either during common planning times or department meetings. Mini BIMs are one way the staff can develop curriculum that is inquiry based and with BIT.		
West Windsor-Plainsboro Regional Schools	The math program is presently implementing many of the recommendations that emanated from a recent Mathematics Program Review. Math and literacy have high priority in the K-5 grades. More time is being designated to these areas and thus poses a challenge for making science as important as ever. Part of our Phase II plan will be to use BIT as a way to place science in the center of cross-curricular connections. PLCs will study, in part, how to use science as the center of and link between other curricular areas. The proposed and condensed NJCCCS are built on big ideas. Our PLC will use these to revisit our present K-12 curricular sequence which is mapped on an online program, *Rubicon Atlas,* and is accessible to all WW-P staff.	**GOALS**: Our main goal is to foster the same big idea thinking inherent in BIM design by: 1. Expanding our PLC to include eight or ten members and modeling *The Tuning Protocol* in order to acquire the characteristics and skills of a well functioning PLC. 2. Answering a BIT question, "How can we best promote the value, process, and application of BIT throughout our district?" 3. Creating six user-friendly maps, two each summer, to be placed on WW-P's *Rubicon* site and in the hands of all teachers of science, especially new and new-to-WW-P. This task will require a clear understanding of BIT, meaningful cross-grade level articulation, and a careful review of the K-12 Science scope and sequence with an eye toward better alignment and coherence. **BIT in Action Plan:** 1. Using the revised NJCCCS and the Atlas of Science Literacy to create two maps each summer which will be tailored to WW-P's science curricula. Users of the documents at will be able to	a.Map district chemistry strand: • Dev protocol for mapping • Map chem. Strand Assess effectiveness b. Review Summer 09 work c.Discuss expanded PLC and Recruit 8 new teachers (2nd Mapping Team) to be trained in mapping protocol d.Identify Summer 2010 strands to be mapped (#2 and #3) e.Set expectations for assessment/data collection/reflection questions f.Leadership Team uses map in '09-10 school year . Reflection questions and responses to assess effectiveness g. Leadership Team develops training for 2nd Mapping Team and trains 2nd mapping team h. Offer Workshop (30 participants): • AM: mini-BIM • PM: BIT, PLCs, assessment, using maps i. Present "Using the Chemistry Map" at faculty/staff meetings	a. Chemistry concept strand map (map #1) b.Assessment of 1st mapping c. 2nd Mapping Team d. Concept strans for maps #2 and #3 e.fine-tuned assessment strategy f.experience implementing use of map to guide instruction g.Mapping Team training protocol and trained 2nd Mapping Team h. 30 additional teachers exposed to maps, BIT and mini-BIMs i.Faculty and staff better prepared to use maps

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		clearly see and follow essential understandings at all grade levels, from below and above their own. 2. A flow chart and/or concept map which not only embeds and focuses on BIT, but makes obvious the development of cognitive skills, what we now know about how children learn (science). 3. A guide to use during lesson design and all types of assessment (especially to inform instruction). This work should translate into the classroom by having teachers feature big ideas throughout a unit and even the year, refer to them in order to promote connections, and to prompt questions that require scientific thinking.	j. Present Maps #2 and #3 to eight teachers k. Present Workshop (30 participants): • AM: mini-BIM • PM: BIT, PLCs, assessment, using maps	effectively j k. 30 additional teachers exposed to maps, BIT and mini-BIMs

Look for:

1. PLC learning
2. Impact in the district

Questions to ponder:

1. What will you/your PLC learn?
2. Who else will learn? What will they learn?
3. What will change?