Pittsburgh Science & Technology Academy

Pittsburgh Public Schools | Excellence for All

Dream. Discover. Design.

Abstract and Executive Summary

September, 2008

Pittsburgh Public Schools

Office of High School Excellence

Abstract

Students at Pittsburgh Science and Technology earn a prestigious honors diploma by demonstrating the ability to dream, discover, and design. They leave the school only after completing four advanced courses and choosing a specific postsecondary opportunity.

This Science, Technology, Engineering, and Mathematics (STEM) focused school is founded on the belief that anyone is capable of successfully completing advanced coursework in STEM fields if they want to do so. At the same time it recognizes that different students require different amounts of time and different amounts of support to prepare for this challenge. Thus, four core innovations are necessary in order to achieve the school's ambitious mission.

Innovation #1: **Dream. Discover. Design.**

Students at Pittsburgh Science and Technology constantly dream, discover, and design. These characteristics of successful scientists, engineers, and innovators are developed through a curriculum rich with experiences that develop each of these abilities.

Innovation #2: **A Unique Honors Diploma**

In order to earn the Pittsburgh Science and Technology Honors Diploma students complete four advanced courses. They are: (1) Advanced Research Methods, (2) an Advanced Science, (3) an Applied Research Experience, and (4) and an Advanced Postsecondary Prep course.

Innovation #3: **A Personalized System for Promotion**

Different students will require different amounts of time to prepare for these advanced courses. Therefore a five-level structure replaces the traditional 6-12 system. Students are able to complete 9^{th} – 12^{th} grades in three, four, or five years, ensuring that they graduate only when they have reached a level of achievement aligned with the expectations of employers and/or universities.

Innovation #4: **Interdisciplinary STEM Concentrations**

Students at the upper levels focus their studies in one of four STEM concentrations. They may choose from the: (1) Environmental Sciences; (2) Life Sciences, (3) Engineering Sciences; or (4) Computer Sciences.

Additional systems and innovations

Additional highlights include weekly meetings between students and their faculty advisor, a system for long-term scheduling, a schedule that supports inquiry-based instruction and partnerships with local universities, businesses, and community organizations. The school will open in 2009 with 250 students in grades 6-9 and grow to serve 550 students in grades 6-12.

PST recognizes that excellent instruction is the key to success and has created a philosophy and system for the attraction, retention, and development of excellent instructors. Rather than structuring systems to make success possible, systems are structured to make success probable.

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Project Background

The Pittsburgh Public School Board and Superintendent of Pittsburgh Public Schools Mr. Mark Roosevelt have initiated *Excel.9-12: The Plan for High School Excellence,* part of a larger "Excellence for All" public school improvement agenda.

Recognizing the expanding economic and intellectual opportunities in science and technology fields the School Board and Superintendent made a commitment to opening a science and technology school. This school is part of the District's strategy to help students become "Promise Ready". A model for responsible public innovation, the school is designed to help each student plan and prepare for the unique financial aid opportunity provided by the Pittsburgh Promise[1] and/or the pursuit of a postsecondary opportunity of their choice.

Utilizing the research and design expertise of Pittsburgh's strong universities, Mr. Roosevelt engaged a team of graduate level researchers from the H. John Heinz III School of Public Policy and Management to complete the initial design and planning phase of this school through best practice research, engagement with community experts, a secondary literature review, and data analysis. The ten members of the project team concluded their study in December of 2006 and presented their recommendations to the Board in January of 2007.

Between January and May of 2007 four graduate students from the original project team continued their work. The curriculum framework was expanded and revised as systems were integrated into a working master schedule. Simulations of student flow through PST based on PSSA and PPS data allowed the team to provide initial estimates of the number of courses, teachers, and students that would allow the school to operate as designed.

In July 2007 Pittsburgh Public Schools staff assumed full responsibility for the project. The School Board, with the financial support of the Buhl Foundation, hired project manager Sam Franklin and consultants Judy Hallinen (CMU) and Michele Cheyne (University of Pittsburgh) to lead revision and implementation. This work is ongoing, advised by a Steering Committee and managed through the Office of High School Excellence.

More than 200 community experts representing the for-profit, not-for-profit, K-12 education, and university sectors have contributed directly to this design. Secondary research drew from more than 175 books, reports, and journal articles. Team members researched, visited and spoke to representatives from dozens of successful public schools, many of which focus their curriculum in science, technology, engineering, or math

The school is scheduled to open in 2009 with 250 students in the 6^{th}-9^{th} grades. It proposes four primary innovations designed to provide the flexibility and support necessary to challenge every student in a safe and exciting learning environment. This report introduces these innovations, provides an overview of the proposed program, and contains an appendix which summarizes the challenges that this school is designed to overcome and the benefits of opening this program for students, families, Pittsburgh Public Schools, and the city of Pittsburgh.

[1] More information about the Pittsburgh Promise can be found online at www.pittsburghpromise.com.

Student Outcome Goal, Mission and Vision

Student Outcome Goal

Students will constantly demonstrate the ability to dream, discover and design. Each student will graduate only after successfully completing the four required advanced courses *and* choosing a specific postsecondary opportunity.

School Mission

Pittsburgh Science and Technology will prepare *all* students for postsecondary success by providing a rigorous curriculum that requires four types of advanced coursework and is characterized by excellent instruction, exploration, and a commitment to achievement. All students will leave the school connected to college or to a work opportunity.

School Vision

Pittsburgh Science and Technology students demonstrate the ability to dream, discover, and design. Regardless of the academic level that students bring to the school, all students will meet state standards in math, science, technology and English before graduation. In addition, all students will successfully complete the four required advanced courses and leave the school connected to their next professional or educational opportunity.

An orderly learning environment, extensive support systems, and the alternative approach to promotion allow all students to succeed in advanced coursework. **The curriculum is authentic and adaptive**, emphasizing depth over breadth. Four exciting academic concentrations, a flexible schedule, and individualized programs ensure that each student graduates prepared to exceed the expectations of 21st century colleges, universities, and employers.

PST recognizes that **excellent teaching** by highly trained and dedicated instructors is the single most important factor in determining its success. Faculty members are provided with the time and support necessary for continuous instructional improvement and sustained job satisfaction, while also being held to high expectations for student engagement, planning, and collaboration.

Sustained community partnerships support career development and provide authentic learning opportunities. **Active participants in their education**, each student makes continuous adjustments to their individualized long-term program according to their academic needs and changing postsecondary goals.

A commitment to equity and diversity ensures that the student body is admitted fairly, that all students are equally supported, and that diversity is achieved and maintained.

Through the implementation and evaluation of its innovations and support systems Pittsburgh Science and Technology seeks to become a premier Pennsylvania high school, demonstrating the power of a systems approach to education reform and redefining the role and structure of secondary education.

Overview – About the PST Design

Location	Pittsburgh Public Schools staff analyzed all potential facilities, according to nine criteria: (1) physical and spatial requirements; (2) equity and access; (3) equipment and electricity; (4) environment for learning; (5) compliance with codes and regulations; (6) school within a school vs. independent facility; (7) fit with existing and developing programs; (8) fiscal responsibility; and (9) potential for partnership creation. The result is the recommendation that school open in Oakland at the Frick building located at Thackeray St. and Fifth Avenue.
Student population	For 2009-10 the school will accept: • 100 ninth grade students; • 50 eighth grade students; • 50 seventh grade students; and • 50 sixth grade students. One level will be added each year so that the school will graduate its first students in 2011-12, with a full size Executive Level Class in 2012-13. **PST has been designed to serve 550 students at capacity.**
Admissions process	Each year PST will accept 50 new students entering from fifth grade and approximately 50 new students entering from eighth grade with variation depending on the number of students in the school at the time. The school will accept a small number of students each year entering from the sixth, seventh, eighth, and ninth grades in order to maintain the 550 student capacity. **The proposed admissions process is a weighted lottery system.** There is no minimum academic standard to enter the lottery after the fifth, sixth, or seventh grades. Students entering from eighth grade must have achieved a minimum standard of Basic on the PSSA math and reading tests in order to enter the weighted lottery. Students entering the school after the ninth grade must demonstrate that they have achieved Proficiency on the PSSA tests.
Teachers, administrators, and other staff	**15 teachers and three administrators/counselors will teach courses at PST during its first year of operation.** At capacity there will be approximately thirty three teachers and six teaching administrators. This includes: • Twelve Science and/or Technology instructors; • Eight Math instructors; • Five English/Communications instructors; • Two Foreign Language instructors; • Three History/Social Studies instructors; and • One Gym, one Art Technology, and one Music Technology instructor. The Technology Coordinator, the Counselor, the Director of Community Relations, the Director of Students, the Director of Research (Librarian), and the Principal complete the staff.
Courses and curriculum	The first years of the PST experience emphasize the **dream** component of the dream, discover, design framework. This stage seeks to cultivate curiosity, interest, and a love for learning. Gradually the emphasis of the curriculum shifts to **discovery** and the acquisition of specific knowledge and skills. Finally, during the culmination of their program, students learn to apply their knowledge and skills to new situations through experiences and units that require **design**. Throughout, depth of learning is emphasized over breadth and coherent sequences rather than a smorgasbord of electives. Approximately 75 courses will eventually be offered, structured in carefully designed sequences. These courses are offered in different lengths to increase scheduling flexibility. They range from yearlong courses to ten-week, quarter length “mini” courses. **Students are required to complete four types of advanced coursework** at the Executive Level, the equivalent of the “senior year”. These advanced courses include:

	• Advanced Research Methods; • An Advanced Science course; • The Executive Experience (An authentic discovery and design experience); and • An advanced postsecondary preparation course. Though the curriculum is concentrated in science and technology fields, it is not expected that *all* graduates will work or study in science and technology after graduation. Students will acquire the thinking and learning skills necessary for success in any area of interest.
Schedule	**A unique five-period schedule and extended school day** are proposed in order to provide time for support, intervention, and enrichment. It is recommended that the school day be extended to 7 hours 21 minutes, with an eight hour paid workday for teachers. Four eighty-minute academic periods surround a 99-minute activity period that includes three lunch shifts.
SciTech Concentrations	**Students enter one of four Science and Technology concentrations after completing the equivalent of the ninth grade.** The concentrations consist of a sequence of courses that are new to Pittsburgh Public Schools. The concentrations are designed to integrate science and technology standards into thematic courses. They are the (1) Environmental Sciences, (2) Biological Sciences, (3) Engineering Sciences, and (4) Computers Sciences.
Career and College Readiness	**Science and technology focused courses are not the only new classes to be introduced at PST.** There is also a Postsecondary Preparation sequence which includes weekly meetings with a faculty advisor who guides the student through their entire PST experience. The sequence also includes two Postsecondary Preparation courses. These courses teach skills necessary for postsecondary success including resume building and interview skills.
Professional Development	PST recognizes that excellent teaching, by highly trained and dedicated instructors, is the single most important factor in determining its success. Therefore, the school accepts responsibility for creating systems that encourage professional growth and creativity *without* adding additional burdens to teachers' already significant workload. • All teachers at PST have at least one daily eighty-minute Professional Period. • Teachers are paid for eight hour work days. • The on-campus **Professional Education Program** allows teachers to rotate annually through one quarter of structured, collaborative professional development during the school day. Teachers practice new skills, participate in lesson study, and meet development requirements in a way that is individualized and meaningful.
Partnership Development	**Sustained community partnerships** ensure that teachers and students collaborate with university, community, and industry partners to provide authentic dream, discover, and design opportunities. One specific partnership being developed is with the Pittsburgh Science of Learning Center. It focuses on middle grades science course improvement and supports additional professional planning time for all five sixth through ninth grade science teachers.
Extracurricular Activities and After School Sports	PST students can participate in sports at the high school in their neighborhood, as is currently the case at the Center for Creative and Performing Arts (CAPA). The school also expects to offer a range of after school programs. However, in addition to these standard offerings, **the PST schedule includes a school-wide support and activity period.** This daily 66 minute period, organized in ten week blocks, allows students access to flexible periods of academic support, fitness opportunities, and/or the chance to extend specific academic projects.

Innovation #1: Dream. Discover. Design.

Students at Pittsburgh Science and Technology constantly dream, discover, and design. The curriculum, support systems, and structure of the program are designed to nurture these three characteristics of successful scientists and engineers. Students consistently participate in learning by design experiences, Design and Discovery projects, goal-setting, and hands-on lessons which cultivate curiosity and develop enthusiasm for STEM fields.

At PST to **dream** means to demonstrate the ability to generate ideas, set big goals, and act with creativity and curiosity. Students set goals then learn to create and execute a plan for achieving them. The dream component of the framework is also associated with entrepreneurial thinking and demonstrated enthusiasm for STEM content.

To **discover** means to perform research, to formulate questions and to find the answers. Students have a number of large-scale research opportunities which become more complex as students progress through the program. Students learn to explore and to analyze and acquire core academic competencies in math, reading, history, and foreign language which support high-level scientific research.

To **design** means to create, to produce something tangible. This might mean the fabrication of an exhibit, the assembly of a robot, or the creation of a prototype, model, or simulation. Students demonstrate the ability to apply their dream and discovery skills to the development of something that can be touched, demonstrated, built or displayed in the museum displays which are integrated into the facilities plan for Pittsburgh Science and Technology.

The PST program culminates in the Executive Experience, an authentic group research and design project which partners a group of students with a university or industry partner to tackle a real research or design problem. Through this work students have the opportunity to make a real contribution to a STEM field. Students who wish to pursue high-level research as an individual have the opportunity to do so through the third period enrichment program.

The integration of Discovery and Design is inspired by the interdisciplinary vision of the program. The curriculum seeks to operate in a theoretical region identified by Donald Stokes as Pasteur's Quadrant, a place in which research for the sake of understanding (Discovery) is combined with research that considers practical application and use (Design).[2]

The dream, discover, design mantra establishes the vision for the type of instruction that should be happening in each classroom, every day. It describes what students should experience in each lesson, each unit, and in their entire program. It also informs all decisions related to planning and implementation of the program including the layout of the facility, the hiring of staff, and the development of new courses.

The mantra was inspired by education theorist Alfred North Whitehead's "rhythms of

[2] Stokes, D. E. (1997). Pasteur's quadrant : basic science and technological innovation. Washington, D.C., Brookings Institution Press.

education". It was modified through the incorporation of a significant body of research and the input of dozens of experts, advisors, and community members.

Whitehead described three essential stages of education. He argued that all learning should progress through each of them.[3] The stages are:

A. **Romance**, when the subject matter has the excitement of unexplored connections.
B. **Precision**, when "width of relationship is subordinated to exactness of formulation". This stage is deemed the "stage of grammar", the grammar of language and of science.
C. **The stage of generalization** or synthesis. This stage is "a return to romanticism" with "the added advantage of classified ideas and relevant technique".

The graphic below outlines how Whitehead's ideas have been adapted and applied to the PST program.[4] The full PST curriculum, and also its units, and lessons will be designed and implemented according to three stages; (1) Dream, (2) Discover, and (3) Design.

"Rhythms of Education"	Modified Key Words	Lessons	Units	Full PST Program
Romance "the vividness of novelty" and the excitement of unexplored connections	**Dream**	Open lessons with a "hook" that inspires curiosity, establish objectives and assess results	Generate questions, set big goals, generate ideas	Students demonstrate curiosity, creativity, and entrepreneurship while consistently monitoring progress toward long term goals
Precision "width of relationship is subordinated to exactness of formulation"	**Discover**	Conduct research and discover new skills and/or information	Acquire knowledge and skills through research	Students constantly lead and participate in research and exploration
Generalization "a return to romanticism" with "the added advantage of classified ideas and relevant technique"	**Design**	Apply new information/skills to real situations or new types of problems, produce something tangible	Apply knowledge and skills to answer questions through inquiry driven projects which produce something tangible	Research and exploration consistently culminates in an object or product which can be touched, presented or displayed

[3] Whitehead, A. N. (1929). The Rythms of Education. The Aims of Education and other essays. New York, NY, The Free Press, A Division of Macmillan Publishing Co., Inc.**:** 13.
[4] Alfred North Whitehead's Rhythms of Education are explained in the previous section of this document.

Innovation #2: A Unique Honors Diploma

Like many prestigious STEM focused public schools including Thomas Jefferson High School for Science and Technology in Alexandria, VA and Baltimore Polytechnic Institute in Baltimore, MD, Pittsburgh Science and Technology plans to offer a unique diploma, with course and credit requirements that go beyond those required to graduate from other schools in the same district. The opportunity to earn this honors diploma, and the commitment to earning it which is made by students and their families when they enter the program, establishes a set of expectations that are uniformly high and aligned with those of universities and 21st century employers.

In order to earn the Pittsburgh Science and Technology Honors Diploma students must complete four advanced courses. They are: (1) Advanced Research Methods, (2) an Advanced Science, (3) an Applied Research course called the "Executive Experience", and (4) and an Advanced Postsecondary Prep course called "Postsecondary Preparation II".

The four advanced courses summarized in the graphic below are required in order to earn the Pittsburgh Science and Technology Honors Diploma.

Course	Description
Advanced Research Methods	In the **Advanced Research Methods Course** students demonstrate advanced research skills including statistical analysis, experimental design, and presentation of results.
Advanced Science	In the **Advanced Science Course** students demonstrate mastery of content in their STEM concentration.
Executive Experience	In the **Executive Experience** students complete a semester or yearlong discovery and design project in partnership with a university, industry or community organization.
Postsecondary Preparation II	In the **Postsecondary Prep II** course students research, select, and apply for a postsecondary opportunity.

Each of these courses is the culminating experience for one of the core components of the PST curriculum. The Advanced Research Methods course is the culmination of the research and discovery skills component. The Advanced Science is the culmination of the STEM concentration sequence. The Postsecondary Prep II course is the culmination of the "Dream" or goal setting component of the curriculum. Finally the Applied Research course, known as the "Executive Experience" is the culmination of the entire program, integrating Dream, Discovery and Design into an authentic research and design project performed in partnership with a university or industry partner.

Innovation #3: A Personalized System for Promotion

An innovative organizational structure is required since PST seeks to challenge students who are already well prepared academically, while also changing the academic trajectory of those who enter the school working below grade level. Thus, the organizational structure of PST looks very different than that of a traditional secondary institution.

Instead of moving through seven traditional grade levels (sixth-twelfth grade) students progress through five levels. **In this system students are able to complete the ninth-twelfth grades in three, four, or five years.**

The purpose of this alternative structure is to provide the opportunity for students at the high school level to either accelerate their program or, alternatively, to opt for an extra year of high school in order to prepare for the advanced courses, obtain the honors diploma, and graduate with skills that are aligned with the expectations of 21st century universities and employers.

The proposed program works as follows. Three "anchor" years are associated with important academic and developmental transitions. These anchor years, the 6th grade (Novice Level), 9th grade (Associate Level), and 12th grade (Executive Level) are designed to be completed in one academic year. These anchor years surround two more flexible levels, most importantly the Manager Level. The Manager Level is the equivalent of the tenth and eleventh grades. It can be completed in one, two or three years, thereby enabling students to move at a personalized pace without forcing them to repeat courses.

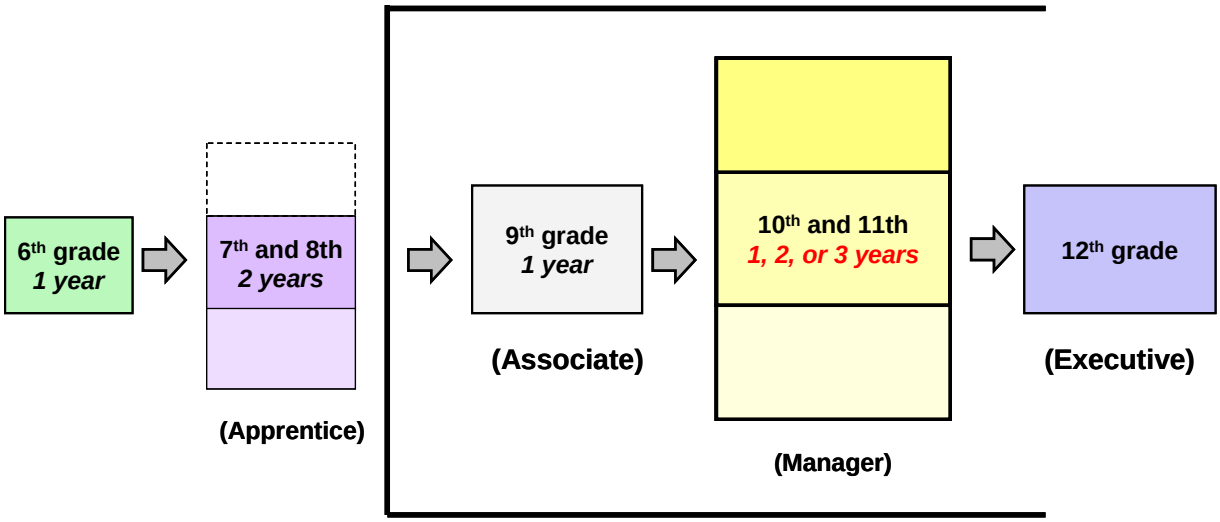
Math courses serve as the mechanism for promotion through the five-level system. Each math course is offered in semester and yearlong versions in the 80-minute block schedule. Thus, students who require additional time or support may take a yearlong math course with a significant amount of time built in for support and individualized intervention.

As a result of this structure no PST students are tracked into a watered down math sequence. Instead, all students move through the same sequence of challenging courses but they may do so in a different amount of time given their individual needs. Students who may be struggling in math or who entered the school significantly behind may choose to take the extended, highly supported yearlong courses. At the same time, students who are ready to do so may move through the same sequence in an accelerated manner, potentially completing their sixth through twelfth grade math sequence in as few as five years.

There are two primary points of entry into the PST program. Approximately half of all PST students will enter the school after fifth grade, starting at the 6th grade or "Novice Level". The other half enters the school after completing the eighth grade and starts the program at the 9th grade or "Associate Level". Each of the five levels described below is aligned with:

- The levels that surround it;
- The developmental transitions of students; and
- The dream, discover, design curriculum framework.

A five-level structure makes it possible for students to complete the 9th – 12th grade portion of the program in three, four, or five years, ensuring that they graduate only when they have reached a level of achievement aligned with 21st century expectations.



At the 6th grade (Novice Level) the **dream** component of the curriculum is emphasized as students explore STEM fields for the first time and begin to plan their full PST experience. The emphasis of the curriculum gradually shifts to **discovery** through the Apprentice and Associate Levels and into the Manager years. When students reach the 12th grade (Executive Level) the emphasis has shifted to application and **design**.

A summary of each of the five levels is provided below.

Sixth Grade - The Novice Level

Students who enter the program after the fifth grade begin at the Novice Level. This level is one year long and is equivalent to the sixth grade.

The Novice Level focuses on the **dream** component of the framework by developing curiosity, creativity, fascination with STEM content and careers, and a general love for learning. Authentic experiences and extended thematic units supported by community partners expand students' worldview and empower students by encouraging them to become experts in areas that appeal to their interest and personality.

Units emphasize connections between technology, science, and community, giving students real opportunities to better their city while learning about authentic applications of the skills and knowledge that they will later access at a high level. At the same time students will be

learning specific standards-based math, reading, and writing skills necessary to support their transition from this romance phase to one with greater emphasis on specific skills.

At the Novice Level students complete their first semester long dream, discovery, design projects.

7th and 8th Grades - The Apprentice Level

The Apprentice Level is two years long and equivalent to the seventh and eighth grades. Students enter this level after completing the Novice Level. They will remain at the Apprentice Level for two years with a possible third year for students with exceptional academic deficits or possible acceleration to one year for students who demonstrate exceptional abilities and choose to speed up their program.

Skills and information are emphasized throughout this level. Technology programs facilitate the individualization of instruction and allow students to move at their own pace. In certain courses teachers follow their students through both years of this level. The emphasis on individualization means that teachers spend as much time as facilitators or academic coaches as they do as traditional instructors.

When students demonstrate academic and developmental readiness they are promoted to the Associate Level, the second anchor year.

9th Grade - The Associate Level

The Associate Level is the second anchor year and the second primary entry point into the PST program. It is one year long and is equivalent to the ninth grade.

The Associate Level is designed to provide a challenging body of coursework for students entering ninth grade from within the school and also from other K-8 or 6-8 programs. The Level includes opportunities for enrichment and intervention according to individual academic need. Students master the skills necessary for eventual success in advanced coursework in a personalized environment. The Associate Level includes:

- A yearlong Science/English interdisciplinary experience that teaches writing and research skills through inquiry-based Physics, Chemistry, and Biology explorations;
- A yearlong Specialized Mathematics course, combined with a structured support period for intervention and enrichment, providing all students with the mathematics foundation necessary for success in applied sciences;
- The development of an individual learning plan in partnership with their faculty advisor who will work with the student throughout PST.

Support and positive relationships are emphasized during this critical anchor year. Students begin the postsecondary preparation sequence, learn about and select from the concentrations offered at PST, and work with their advisor, teachers, and family to begin designing the next two, three, or four years of their program.

At the Associate Level students complete their second semester long Dream. Discover. Design experience.

The Associate Level is also the second entry point for students. After completing this one year level, students move to the Manager Level.

10th and 11th Grades - The Manager Level

The Manager Level is the most flexible level in the program. It may be completed in one, two, or three years and is equivalent to the tenth and eleventh grades. Students experience an adaptive curriculum designed to prepare them for advanced coursework. They are promoted to the Executive Level only after demonstrating that they are ready for advanced coursework.

The Manager Level curriculum allows students to complete necessary courses at an appropriate pace, allowing for completion in as little as two semesters and as many as six. It is anticipated that most students will complete the level in four semesters. Highlights of the level include:

- The beginning of concentration coursework sequences (See Innovation #4 on page 16), including the Introductory Course and Rotations;
- The first Postsecondary Prep course which includes SAT preparation and an introduction to college and/or job searches.

During their first year at the Manager Level students begin their concentration sequence (See Innovation #4 on page 16).

12th Grade - The Executive Level

Students are promoted to the Executive Level when they demonstrate readiness for advanced coursework. This rigorous level is one year long and is equivalent to the twelfth grade.

At the **Executive Level**, students integrate learning from the previous levels, applying their skills to real-world situations. At this level students complete the four types of advanced coursework described on page 12 and required in order to receive the honors diploma.

Students complete their final semester or yearlong Dream. Discover. Design projects.

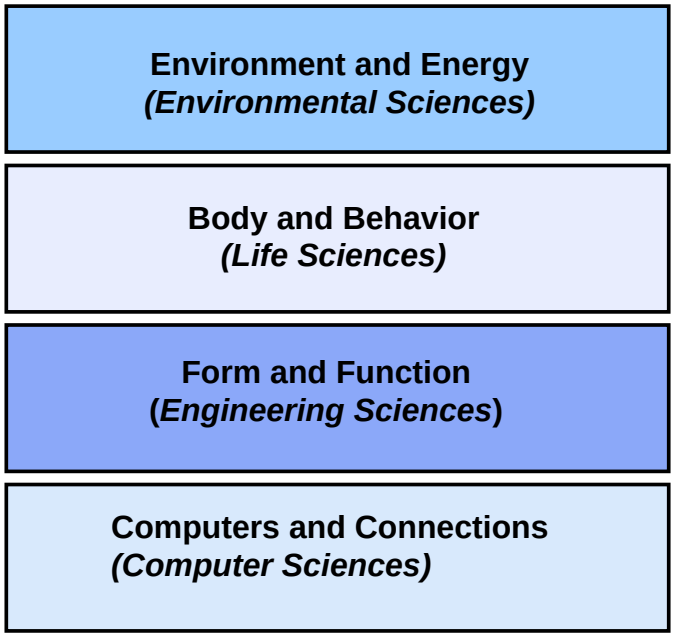
Innovation #4: Interdisciplinary STEM Concentrations

PST offers four interdisciplinary **STEM concentrations**. Each PST student enters one of these concentrations upon completion of the Associate Level. Each concentration is a sequence of seven core courses designed to support students as they progress to advanced STEM coursework. The concentrations are also a physical "cluster" of classrooms and labs.

With the help of dozens of scientists, engineers, university experts and STEM education experts the concentrations have been identified as **(1) Energy and Environment (Environmental Sciences), (2) Body and Behavior (Life Sciences), (3) Form and Function (Engineering Sciences), and (4) Computers and Connections (Computer Sciences)**.

The concentration sequence, like the rest of the PST curriculum, is designed to connect students to postsecondary opportunities. Strategically selected, the concentrations teach in-demand skills relevant to established or emerging sectors of Southwestern Pennsylvania's regional economy.

Students enter one of four SciTech Concentrations after completing the Associate Level. These concentrations have been identified through consultation with regional experts, analysis of workforce trends, and additional secondary research.



The four recommended concentrations balance exposure to a broad range of tools and information with opportunities for in-depth inquiry.[5] They operate in "Pasteur's Quadrant." That is, the concentrations are based on the theory that scientific exploration should be inspired both by a quest for fundamental understanding *and* by considerations of use. Therefore they are

[5] These concentrations are only tentatively identified. Focus groups and expert input from industry and education experts will finalize these concentrations.

not only about discovery. They also require design.

Similarly, Science and technology are not separated, with one being the product of the other, but they are taught together. In each concentration inquiry-driven projects integrate the practical with the purely scientific. Upon completion of their concentration students will be prepared for college study or ready for employment in a skilled position in the region.

The concentration sequence also follows the dream, discover, design framework, generating curiosity, building knowledge and skills, and ultimately requiring application of knowledge to new and authentic problems or experiences. There are seven required courses in each concentration, referred to as the "core" courses. There are additional elective courses that may be taken either within or outside of the selected concentration.

The STEM concentration sequences include 7 core courses and additional electives supporting students as they move to advanced coursework.

Course	Length	Description
Preview Course	**Quarter**	A learning by design experience to get students excited about the concentration.
Introductory Course	**Quarter**	A survey of the great problems in the past, present, and future of the discipline
Four rotations	**Quarter**	Four project-based courses that cover specific concentration topics in greater depth
STEM Electives	**Semester**	Additional courses that may be taken within or between concentrations
Advanced Concentration Course	**Semester**	Macro level course integrating the skills and theory of previous courses

Two PST science teachers teach in each concentration. Each team of two teachers is responsible for developing, teaching, and continuously evaluating their concentration. Although they may teach as many as eight different courses in one school year, concentration teachers never teach more than two courses at a time. Due to the significant amount of responsibility associated with these positions concentration teachers require more planning time than other members of the faculty. Therefore, concentration teachers have two eighty-minute planning periods per day for the entire school year.

A cohort of twenty-five students will enter each concentration at the beginning of each year. This group of first year Managers will move together, as a cohort, through their Introductory Course and five Rotations. They will have the same teacher for each of these courses, facilitating the establishment of close personal relationships.

Upon completion of the Rotations, some students from the cohort will move directly to the Advanced Science course at the Executive Level. Other students will take additional SciTech electives as they complete the acquisition of the prerequisites necessary to succeed in the advanced course.

The number of students in each concentration will fluctuate with the population of the school. Simulations suggest that concentration populations will range between 60 and 80 students depending on the number of students graduating in three, four, and five years. Students will work with their faculty advisor to carefully plan their programs with significant foresight.

Environment and Energy (Environmental Sciences)

This concentration focuses on the environment and the social and scientific study of energy. Students will develop scientific problem-solving and critical thinking skills by exploring foundational concepts about how humans affect and interact with energy and matter in our environment and on our planet. Courses may include: Ecology, Great Problems in Environment & Energy, Atmosphere, Energy Systems, Material Cycles, the Built Environment, Environmental Case Studies, and Risk Assessment.

Body and Behavior (Life Sciences)

This concentration focuses on life and the actions and reactions of objects and organisms. Students will develop scientific problem-solving and critical thinking skills by exploring foundational concepts about how humans and other life forms use energy, matter and information to function and interact with each other. Courses may include: Biotechnology, Great Problems in Body & Behavior, Organism Interactions, Regeneration Science, Infectious Diseases, Cellular Communication, Genomics, and Chemical Analysis.

Form and Function (Engineering Sciences)

This concentration focuses on engineering technology, design, and modern manufacturing. Students will develop scientific problem-solving and critical thinking skills by exploring foundational concepts about how to create designs and structures that support human existence. Courses may include: Computer Aided Design, Great Problems in Form & Function, Controlled Power, Material Structure, Prototyping, Electrical Design, Design Consulting, and Horizontal Structures.

Computers and Connections (Computers Sciences)

This concentration focuses on computation and the social and scientific study of networks. Students will develop scientific problem-solving and critical thinking skills by exploring foundational concepts about how to use computers, computation, and technology to solve problems. Courses may include: Programming Games, Great Problems in Computers & Connections, Arts Applications, Computational Science, Math Models, Societal Systems, Advanced Programming, and Artificial Intelligence.

Additional Systems and Innovations

PST intends to compete for qualified professionals through thorough marketing and hiring processes, but also by creating an exciting work environment that minimizes isolation, frustration, and fatigue. Teachers are treated like professionals and expected to produce professional results. Systems are structured to maximize the rewards of teaching and make success probable.

Like successful companies, PST has created a philosophy and system for the attraction of excellent instructors. The philosophy is that excellent instructors will be attracted to an organization that thoughtfully designs systems to support their success. Three components of the PST design work together to make sure that teachers are likely to enjoy their work and be consistently successful. These systems help PST attract, retain and develop excellent STEM instructors.

1. Personalized professional development
2. A schedule structured for teaching success; and
3. An innovative organizational chart.

Personalized Professional Development

Only professional development that is sustained and time-intensive has demonstrated the ability to improve instruction, impact student achievement, and contribute to teacher retention.

In order to overcome the challenges associated with developing and retaining high quality teachers, the Professional Development System:

1. Provides an intensive amount of flexible but focused time-on-task;
2. Creates systems of consistent collaboration and support;
3. Supports technology integration and 21st century skills instruction; and
4. Measures results in order to hold teachers accountable for student achievement.

The Professional Education Program (PEP)[6] is the cornerstone of the professional development system. Each teacher spends one period in the program every day for one quarter of the school year. During their PEP rotation, teachers will have a daily 80-minute period of structured on site professional development in addition to their regular personal or collaborative planning time.

The PEP course has three primary foci:

1. **Lesson study:** Lesson study is a teaching improvement process that involves teachers working in small groups to design actual classroom lessons. They practice the lesson,

[6] The Professional Education Program (PEP) is named after, and based on, a successful program at Fox Chapel Area High School in Fox Chapel, PA.

observe how it works, make evidence-based improvements, and then share the results.[7] Lesson study is a driving force behind the success of Asian education systems.[8]

2. **Technology Integration:** Teachers practice with technology tools and work together to integrate technology, professional, and high-level thinking skills into their lessons.

3. **Student work**: Teachers spend time analyzing student work and using the results to guide lesson design and instruction. Intervention and enrichment strategies are designed based on the results of student work analysis.

In addition to lesson study, technology skills integration, and student work analysis, teachers in the PEP program spend one day per week discussing an article or study related to child development and/or teaching theory.

Four additional professional components supplement the PEP program without burdening teachers with additional work or forcing them to participate in development that is not directly relevant to their classrooms.

The systems identified in the chart below supplement the PEP program.

Component	Description
Common Planning Periods	Eighty minute daily planning period shared by teachers working in the same concentration
Alternate Wednesdays Early Release Days	Students leave early every other Wednesday, development meetings by concentration, content area, level
Individual Development Goals	Developed, updated, and monitored each year through the Professional Education Program.
Evaluation and Accountability	Formative and summative assessments, possible integration of "value-added" measures

This system is based on evidence that teachers with more time for independent *and* structured planning teach better lessons, exhibit higher levels of job satisfaction, and increase student achievement.

Teachers are contracted for eight-hour days, providing additional time-on-task and ensuring that each teacher will have at least 149 minutes per day (199 during their PEP mini) for personal and professional development. This time includes an 80-minute planning period, a 30-minute lunch, and 39 minutes of contracted time before or after students arrive at school.

[7] Cerbin, B. and B. Kopp. (2006). "Lesson Study Project." Retrieved October 4, 2006, 2006, from http://www.uwlax.edu/sotl/lsp/.

[8] Stevenson, H. W. and J. W. Stigler (1992). The learning gap: why our schools are failing and what we can learn from Japanese and Chinese education. New York, Summit Books.

The PST Schedule

The school day and school year are structured carefully, in order to maximize "time-on-task" for teachers and students. The system is designed to ensure that teachers have adequate time for deep and careful lesson planning, collaboration, and administrative responsibilities such as enforcing classroom rules and communicating with parents. There is enough time to enhance curriculum with discovery and design experiences and integrate creative ideas.

PST operates using a unique five period block schedule. This schedule includes four 80-minute academic periods and a 99-minute support, enrichment, and activity period. **Courses are offered in three different lengths to increase adaptability; yearlong, semester-length, and quarter-length courses ("minis").** Teachers have at least 149 minutes per day without students, and rotate through an additional period of Professional Education, which they participate in for one period during one quarter of each school year.

Pittsburgh Science and Technology will run a 5-period block schedule for a seven-hour, twenty-one minute extended school day, including passing times. Extended school days of this length are already in use in Pittsburgh in the Accelerated Learning Academies.

Periods 1, 2, 4, and 5 will be 80 minutes. Period 3 will be 99 minutes. Students will have a 33-minute lunch period in one of two lunch shifts during this 99-minute block.

The schedule ensures that teachers have the amount of planning time necessary to design consistently engaging lessons. All 33 PST teachers enjoy a daily 80 minute planning period. Some teachers, including all of the science and STEM concentration instructors, have two 80 minute periods reserved for planning due to the nature of the courses they are leading.

Planning time is distributed according to the number of courses the teacher leads in one year. This teacher has two daily 80-minute planning periods.

<table>
<tr><td colspan="6">Environment and Energy Teacher</td></tr>
<tr><td>Period</td><td>Length</td><td colspan="2">Semester 1</td><td colspan="2">Semester 2</td></tr>
<tr><td>1</td><td>80</td><td colspan="4">Common Planning</td></tr>
<tr><td>2</td><td>80</td><td>Preview: Ecology</td><td>Intro: Great Problems in E&E</td><td>Atmosphere</td><td>Energy Systems</td></tr>
<tr><td>3</td><td>99</td><td>Support</td><td>PEP</td><td>Enrichment</td><td>Activity</td></tr>
<tr><td>4</td><td>80</td><td>Material Cycles</td><td>The Built Environment</td><td colspan="2">Advanced Science: Environmental Consulting</td></tr>
<tr><td>5</td><td>80</td><td colspan="4">Cross Concentration Common Planning</td></tr>
</table>

Courses are offered in three different lengths to maximize student choice and scheduling flexibility and to increase time for professional development.

The structure of this schedule also supports the development of sustained positive relationships since no teacher will see more than 75 students in one day, with a number of teachers seeing 50 or less.

Period 3 – Support, Enrichment, Activities, and Professional Education

Period 3 is a school-wide activity period. This 99-minute period includes two 33-minute lunch shifts and two 66-minute activity periods. It is surrounded by four 80-minute academic blocks. The activity period is organized by mini, making it possible for all students to participate in four different activities during each academic year. This period is designed to respond directly to the individual needs of students and also to provide teachers the opportunity to be creative and have fun in a non-credit bearing period within the school day.

At the Novice and Apprentice Levels activities and clubs are emphasized, with support and enrichment opportunities available for students requiring intervention or interested in extending a learning experience.

At the Associate Level, choice of activities is limited to support, intervention, and enrichment. Students will attend the appropriate course depending on their academic needs as determined in consultation with their Keystone advisor.

At the Manager and Executive Levels, teachers schedule minis in response to student input and changing needs. Each mini-length activity will fall into one of five categories:

1. **Academic Support** – Support minis will be available throughout PST. The type of support minis available should be modified each mini to correspond to student needs.

2. **Academic Enrichment** – Students who wish to individually pursue high-level research in a specific field may do so during this period, possibly pursuing national recognition through the Intel Science Talent Search or similar research competition. Alternatively, students might sign up for a team opportunity to further explore an academic area that has caught their interest.

3. **Homework Lab** – Students who are not in need of intensive academic intervention but would benefit from a flexible work period may participate in a homework lab.

4. **Clubs/Activities** – Each mini, teachers lead clubs in response to student interest. Participation in certain clubs qualifies students for academic credit. For example, a student who participates in the running club could receive a ½ gym credit.

5. **Required Courses** – Students who have designed three-year programs will have to use third period to meet certain gym and graduation requirements in at least two minis.

This flexible period adapts to students' changing needs, providing a dynamic break from traditional academic coursework. With the help of their Keystone advisor, students will carefully schedule minis to obtain the continued support they need as they move through the rigorous curriculum. This support will be balanced by the unique opportunity to participate in clubs, activities, and extension exercises normally reserved for after-school programs.

Third period is a flexible support, enrichment, and activity period organized by quarter and including a rotating development period.

	Novice and Apprentice	Associate	Manager	Executive	Teachers
Support	✓	✓	✓	✓	✓
Enrichment	✓	✓	✓	✓	✓
Clubs and Activities			✓	✓	✓
PEP					✓

* PEP is the Professional Education Program, a collaborative professional development period organized in ten week minis and facilitated by the Director of Faculty.

School administration should communicate with students and teachers throughout each quarter to make sure that offerings adapt to meet changing needs.

One of the most important benefits of the activity period is that it supports the **Professional Education Program** (PEP). No teachers will have their individual planning period during third period. Since all adults in the school will be leading an activity (with the exception of lunch staff, secretarial staff, and one administrator), it is possible for teachers to rotate through the PEP program in four groups.

The Organizational Chart

The PST design contains a few unique positions and uniquely distributed responsibilities. These include:

The Director of Student Affairs – In charge of reinforcing the guiding principles, the Director also monitors student learning goals and individual programs, following progress through levels and concentrations. The Director is responsible for managing the admissions process

and leads an Executive Experience section each mini. They also work directly with the student government.[9]

The Director of Community Relations – Deeply embedded partnerships are critical to the success of the school. The Director develops and manages these partnerships. He or she also manages the Parent Center, maintaining a staff of parent volunteers. The Director is a community advocate for the school, managing marketing and recruiting and, eventually, operating small 501(c)(3) fund which will provide grants to teachers for lab equipment upgrades, trips, projects, and competitions.

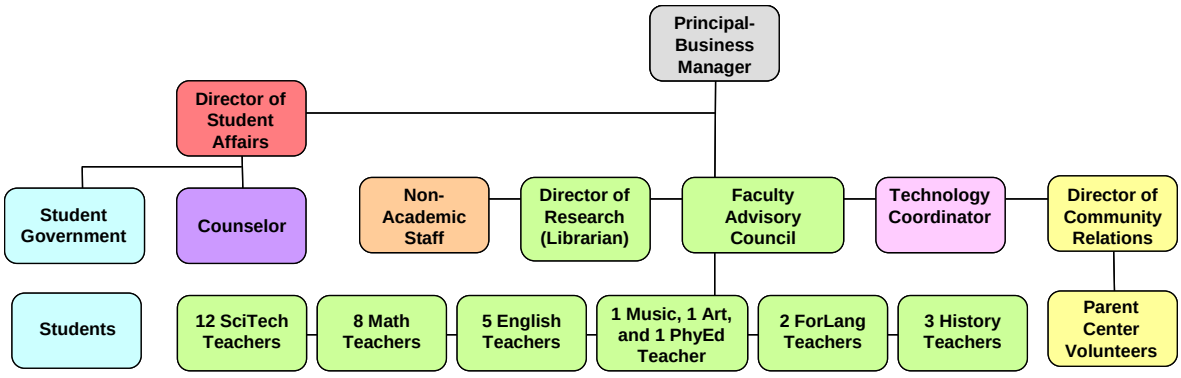
The Technology Coordinator – The technology coordinator administers the proposed 1:1 laptop distribution program for Manager and Executive Level students. They coordinate the student team who manages the school network and repairs devices. They also teach Career Technology and Audio Technology minis to Novice and Associate Level students.

The Director of Research (Librarian) – The Director of Research works closely with students during each of their three major dream, discover, design research experiences at the Novice, Associate, and Executive Levels. They also coordinate the display of project deliverables in the museum display areas and teach the Apprentice Level research methods course, the foundation for the research strand of the PST curriculum.

Six Teaching Administrators – Each of the six PST administrators (Principal, Director of Student Affairs, Technology Coordinator, Director or Research, Counselor, and Director of Community Relations) teaches at least one nontraditional course per mini.

Advisory Program Responsibility - Each teacher serves as an advisor to a group of approximately 10 students. They follow this group of students from the beginning to the end of their PST experience and meet with them each Wednesday during third period.

The Organizational Chart creates positions not found in most comprehensive high schools, while rethinking the job description of traditional positions.



[9] The strength of the principal will determine which of these positions we hire. If the principal's strength is instructional leadership we will hire a Director of Student Affairs. If their strength is in student management we will hire a Director of Faculty and the Principal will be responsible for managing Student Affairs.

A **Faculty Advisory Council** consists of the four concentration leaders, a lead teacher from the Novice and Apprentice program, and the chairs of the Discipline and Activities committee. Leadership of the Discipline and Activities committees rotates annually.

Together these systems create an environment that is exciting and professional, making it probable that, over time, the school will attract, develop, and maintain a staff of exceptional STEM instructors.

The Advisory Program and System for Long Term Planning

Each teacher serves as an advisor to a group of approximately 10 students. They follow this group of students from the beginning to the end of their PST experience and meet with them each Wednesday during third period. Responsibilities of the Keystone advisor include helping set college and career goals, scheduling courses, deciding how to best use third period, and designing three, four, or five year programs. **The advisor also serves as a point of contact for the parents or guardians of their advisees.**

The Parent and Professional Development Centers

A Parent Center and Professional Development classroom are unique spaces within the facility. They make it very clear that professional development and community engagement are priorities, not secondary functions. These spaces are designed to facilitate communication and accountability between staff, families, and community partners. The Professional Development classroom houses the PEP program, described on page 25.

Guiding Principles

A set of guiding principles and school rules establishes a safe and positive environment, setting consistently high expectations for behavior and interaction.

Public and Private Partnerships

To facilitate a relevant curriculum, PST is currently working to establish partnerships with business and academic institutions to support each concentration. As partners, local businesses and academic institutions will work with PST to integrate career education and relevant industry examples into the curriculum. These partnerships will not only increase the relevance of the concentration coursework, but will also enable students to acquire skills that are sought by regional employers. Moreover, a model of engaged partnership among public schools, businesses and academic institutions has the potential to foster mentor relationships among students and businesspeople so that students do not view career education as merely another arduous requirement.

The implementation process to date has made it very clear that there is the need for a better partnership system. Currently it is very difficult to establish or monitor partnerships at the district level. Pittsburgh Science and Technology should be the pilot site for a new,

technology-supported partnership system. This web and database tool would improve the District's ability to: (1) Define, (2) Prioritize, (3) Communicate, (4) Establish, and (5) Monitor and Evaluate private or public partnerships.

Partners with PST will be organized in six categories:

- Communication and Marketing;
- Curriculum and Professional Development;
- Support and Extension Activities;
- Financial, Equipment, and Infrastructure;
- Evaluation and Consultation; and
- Volunteers.

Within each of these categories specific opportunities are articulated and the responsibilities of a partner are clearly defined. This process improves communication and helps all parties understand the expectations, also making it easier to evaluate the success of the partnership.

PST seeks to establish content specific partnerships at each level in each concentration. These partnerships should allow students to authentically experience the connections between science, technology, and community. They should involve students in the work of the organization or university partner beyond a single field trip or guest speaker. Students should work closely with the partner organization throughout the unit, with clearly defined outcomes identified and opportunities for ongoing involvement with interested students.

Benefits of these relationships will accrue to all members. Regional businesses will benefit from the development of the regional employment pool, connections to each other, and the publicity that will be generated by the partnership. Students will benefit from the resources, relevance, and connection to the employment market provided by their relationship with regional employers. Teachers will benefit from their relationship with practitioners. PST will benefit from its students' success.

Conclusion

Breakthrough urban secondary schools range in size, geographic location, and academic focus, but they share a set of important characteristics. Each creates a personalized environment, has strong leadership and support structures, facilitates collaboration, and implements a rigorous curriculum. Even more importantly, each of these schools has a specific plan for leading their students from their first day of school to high achievement, graduation, and postsecondary opportunity.

This executive summary outlines such a plan. With the challenges facing urban high schools in mind, the key elements of this system create an orderly learning environment, encourage the development of positive relationships, establish an authentic and adaptive curriculum, and ensure effective instruction. United by a relentless commitment to the student outcome goal, these systems form a continuum of support that allows all students to access and succeed in advanced coursework, whether they enter the school after the fifth grade or after the eighth grade. The foundation is established for a breakthrough Pittsburgh high school.

There are many steps that must be taken in order for the school to open in 2009. The location must be designed and prepared. A highly qualified and motivated staff must be assembled. The significant number of new or supplemented courses must be developed. An equitable admissions process must be designed. An outreach program must communicate the merits of this opportunity to parents seeking the best option for their high school or middle school age child. The community must be engaged and their input used to improve the design.

The full report and annotated course list contain additional details about each component of PST. A master schedule has been created that links teachers and teaching administrators to courses, and courses to period. A comprehensive course list has been created, and can be finalized as the concentrations are determined and community input considered.

With the support of the city and the development of partnerships Pittsburgh Public Schools is optimistic that this school can open, with these and other innovations intact, in August of 2009. This school will be one of a number of new, forward thinking choices for the students and parents of Pittsburgh as high schools are redesigned to align with the expectations of the 21st century economy.

New educational opportunities are in demand in the region. Hence the implementation of a cutting edge, science and technology focused school is the right decision for the city of Pittsburgh, and an appropriate response to the challenge facing public education in the city.

Appendix A: Context and Benefits

Responding to a National Challenge

Only about 70 percent of American 9th graders are making it to graduation four years later.[10] For African American and Hispanic students graduation rates are lower, 53.4 and 57.8 percent respectively.[11] Equally problematic is the fact that many students who do graduate from high school lack the skills necessary for success in higher education or for connection to a sustainable economic opportunity. In 2002, only 34 percent of graduates were considered to be adequately prepared for college.[12] "Higher education institutions, businesses, and students and families themselves are spending upward of $17 billion each year on remedial classes just so students can gain the knowledge and skills that they should have acquired in high school."[13]

Polls indicate a steady erosion of satisfaction with public education since 1969. [14] Yet, while the decline in public confidence is indisputable, this does not mean that the performance of public schools has been getting worse. The reality is that there has never been a time when all students graduated from high school, or even when the system achieved significantly better academic results than it does today. The problem is not necessarily that our education system has gotten worse. Rather, the primary problem is that public education, particularly urban public education, has failed to keep up with a changing society and economy.

While the education system has remained static, the national economy and the needs of urban employers have been transformed. Deindustrialization, suburbanization, outsourcing, and the relocation of manufacturing jobs away from city centers changed the American economy.[15] Historic and contemporary discrimination magnified the effects of these trends on communities of color. Education policy at all levels has been slow to adapt to this new economic situation.

Jobs which remain accessible from the urban core require higher levels of skill than they did when comprehensive urban high schools were designed. It is no longer appropriate for the school to act as a "sorting mechanism", tracking only a select group of students toward college while leaving the majority to pursue limited low-skilled jobs that may fail to adequately support a family. As the Gates Foundation emphasizes, "Today's large, impersonal high schools were designed for a different era and a different economy."[16]

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[10] EPE Research Center analysis in: Editorial Projects in Education [EPE]. *Diplomas count 2007: Ready for what? Preparing students for college, careers, and life after high school*. Education Week, 26(40), 2007. Retrieved from http://www.edweek.org/ew/toc/2007/06/12/index.html. (accessed July 31, 2007)

[11] Ibid. (Graduation statistics based on data from 2003-04)

[12] Greene, J.P. & Winters, M.A. (2005, February). *Public High School Graduation and College Readiness Rates: 1991-2002*. New York: Manhattan Institute, Center for Civic Innovation. Retrieved from http://www.manhattan-institute.org/html/ewp_08.htm (accessed September 18, 2006).

[13] (2006). Closing the Expectations Gap 2006: An Annual 50-State Progress Report on the Alignment of High School Policies with the Demands of College and Work. Washington, D.C., Achieve, Inc. **:** 32.

[14] Tyack, D. B. and L. Cuban (1995). Tinkering toward utopia : a century of public school reform. Cambridge, Mass., Harvard University Press.

[15] Sugrue, T.J., *The Structures of Urban Poverty: The Reorganization of Space and Work in Three Periods of American History*. 86-117, The Underclass Debate, ed. Michael Katz (Princeton, NJ: Princeton University Press, 1993).

[16] *High Schools for the New Millennium*, Bill and Melinda Gates Foundation, Retrieved from http://www.gatesfoundation.org/UnitedStates/Education/TransformingHighSchools/default.htm (accessed September 15, 2006).

The Challenge Facing Pittsburgh

In Pittsburgh, RAND Corporation estimated that 64 percent of students graduate from high school within five years of starting ninth grade.[17] The rate for African-American students is 58 percent.[18] Structural change continues to affect the Pittsburgh economy, as it does other industrial centers. In the second half of the twentieth century many residents became disconnected from the labor market when milling industries, the backbone of Pittsburgh's manufacturing economy, were mechanized, relocated to the suburbs, or moved overseas. As in other cities, the school system was unable to keep up with the changing economy and shifting social ecology. Many families continue to recognize that the school system is not adequately preparing their children for the post-industrial economy and choose to exit the system, sending their children to one of Pittsburgh's more than twenty private secondary institutions.

The 2005-2006 Pennsylvania System of School Assessment (PSSA) provides more evidence of disconnect between Pittsburgh's public schools and the 21st century economy. Only 58 percent of Pittsburgh eighth graders demonstrate proficiency in Reading, while only 46 percent demonstrate proficiency in Math.[19] Adding to these upsetting percentages is the fact that they measure how well students are mastering grade-level appropriate skills as defined by Pennsylvania state standards, standards which remain low compared to many states and are yet to be fully aligned with the expectations of the 21st century workplace.[20]

Characteristics of Successful Urban Schools

Researchers and education reform leaders have made significant progress in understanding the specific challenges facing urban schools. As these challenges are articulated the characteristics that are necessary for success have become more recognizable.

Drawing from a series of MDRC (www.mdrc.org) evaluations, Janet Quint identified critical challenges associated with low-performing high schools. These challenges, slightly rephrased, serve as a starting point for understanding the keys to success for urban high schools, including Pittsburgh Science and Technology. The school must:

1. Create a personalized and orderly learning environment;
2. Assist students who enter high school with poor academic skills;
3. Improve instructional content and practice; and
4. Prepare students for the world beyond high school.[21]

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[17] Engberg, J. & Gill, B., (2006). "Estimating Graduation and Dropout Rates with Longitudinal Data: A Case Study in the Pittsburgh Public Schools." RAND Corporation, RAND Education Working Paper Series, WR-372-PPS, Retrieved July 31, 2007, from http://www.rand.org/pubs/working_papers/2006/RAND_WR372.pdf.

[18] Ibid.

[19] GreatSchools.net. (2006, 2006). "Pittsburgh School District." Retrieved November 12, 2006, 2006, from http://www.greatschools.net/cgi-bin/pa/district_profile/401/.

[20] (2006). Closing the Expectations Gap 2006: An Annual 50-State Progress Report on the Alignment of High School Policies with the Demands of College and Work. Washington, D.C., Achieve, Inc. **:** 32.

[21] Quint, J. (2006). Meeting Five Critical Challenges of High School Reform: Lessons From Research on Three Reform Models. New York, NY, MDRC**:** 89.

Additional literature supports the significance of these fundamental challenges, while identifying five others. The school must:

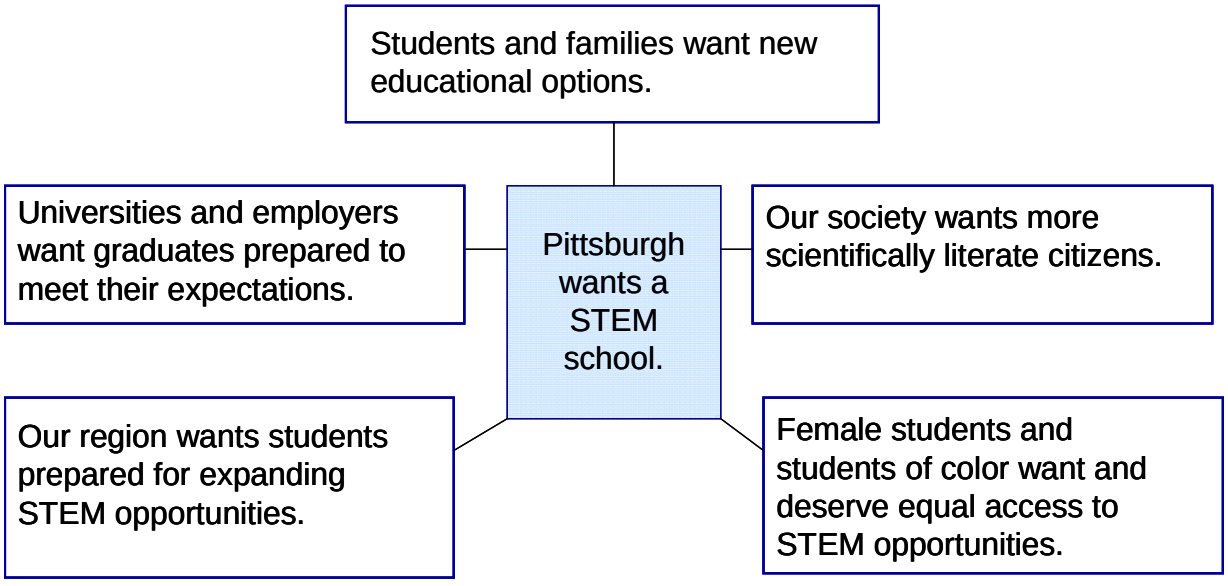
1. Close the racial achievement gap;
2. Solve the social promotion/retention conundrum;
3. Provide the extra support and special attention required in ninth grade;
4. Overcome poor graduation and completion rates; and
5. Ensure that students access and succeed in advanced coursework.

Breakthrough schools[22] across the United States are proving that well-designed and operated urban schools have the ability to achieve these objectives. Achieving success for *all* students requires moving away from the traditional comprehensive high school. A school must provide flexible support systems without sacrificing the challenging enrichment opportunities sought by high performing students who enter school prepared for academic success.

The Need for a STEM Program

The demand for stronger Science and Technology education spans all levels and sectors. Providing enhanced science and technology education, specifically at the high school level, is imperative to create more meaningful educational opportunities to Pittsburgh students, ensure regional growth and economic stability, and close the STEM racial and gender gap. Demand for this program fits into several categories, and there are five primary reasons that this region deserves a forward thinking STEM program.

The city of Pittsburgh deserves a STEM focused school. There is local, regional, and national demand for such a program.



[22] The National Association of Secondary School Principals (NASSP) identifies high-poverty high-minority schools that are achieving exemplary results. See http://www.principals.org/s_nassp/sec.asp?CID=66&DID=66.

Students and families want expanded and improved educational opportunities. In Pittsburgh, too many students are opting out of the public school system. At least 27% of the city's high school age students attend a private, parochial, or charter school rather than a Pittsburgh public school.[23] Additionally, student proficiency rates in 11th grade are only 49% in reading and 60% in math, and an estimated 36 percent of students do not graduate from high school within *five years* of starting ninth grade.[24]

Universities and employers want students prepared to meet their 21st century expectations. Between 2000 and 2015, the Workforce Readiness Project estimates that about 85 percent of newly created U.S. jobs will require education beyond high school.[25] This rise in demand for employees with advanced education does not align with the current comprehensive model for high schools. As a result, the majority of students graduating from U.S. high schools do not have the academic skills necessary to succeed in higher education. In 2002, only 34 percent of graduates were considered to be adequately prepared for college.[26]

The Pittsburgh region wants students who are prepared to take advantage of expanding STEM opportunities. There is significant regional growth anticipated in competitive science and technology industries. The Three Rivers Workforce Investment Board predicts some of the highest growth professions in Western Pennsylvania to directly involve application of science or technology knowledge.[27] These skill driven professions generally have above average annual salaries and include opportunities for professional advancement but require increasingly high levels of technology skills and scientific thinking capabilities.

Our society wants scientifically literate citizens. The United States is struggling to keep up with other nations in science, mathematics, engineering and technology fields. Twenty-eight countries now have a higher percentage of 24 year olds with a math or science degree.[28] Additionally, U.S. students are being outperformed on STEM standardized tests, growth in graduate degrees awarded to international students outpaced graduated degrees awarded to U.S. students by 50%.[29]

Female students and students of color want and deserve equal access to STEM opportunities. According to the National Science Board, African-Americans, Hispanics, and American Indians are less likely to take advanced courses in math and science in high school. Moreover, it is far less common for members of these groups to earn their college degrees or

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[23] Roosevelt, M. (2006). Excellence For All: A Four-Year Comprehensive Framework for Improvement.
[24] Engberg, J. & Gill, B., (2006). "Estimating Graduation and Dropout Rates with Longitudinal Data: A Case Study in the Pittsburgh Public Schools." RAND Corporation, RAND Education Working Paper Series, WR-372-PPS, Retrieved July 31, 2007, from http://www.rand.org/pubs/working_papers/2006/RAND_WR372.pdf.
[25] Casner-Lotto, J., L. Barrington, et al. (2006). Are They Really Ready To Work? Employers' Perspectives on the Basic Knowledge and Applied Skills of New Entrants to the 21st Century U.S. Workforce. Workforce Readiness Project Team. I. The Conference Board. The Conference Board, Inc.**:** 64.
[26] Greene, J. P. and M. A. Winters (2005). Public High School Graduation and College-Readiness Rates: 1991-2002. Education Working Paper. New York, NY, Manhattan Institute for Policy Research. 8: 36.
[27] TRWIB (2007). 2007 High Priority Occupations for Three Rivers Workforce Investment Area. Microsoft Excel. 2007ThreeRiversHPO-Final.pdf. Pittsburgh, Three Rivers Workforce Investment Board**:** Labor market information based on list compiled by the Pennsylvania Department of Labor and Industry's Center for Workforce Information and Analysis.
[28] Atkinson, R. D., J. Hugo, et al. (2007). Addressing the STEM Challenge by Expanding Specialty Math and Science High Schools. Washington, DC, The Information Technology & Innovation Foundation**:** 13.
[29] Ibid.

work in science and technology fields in comparison to their white counterparts.[30] African-Americans, Hispanics, and Native Americans form 25% of the US population, yet earn 16.2% of Bachelors degrees, 10.7% of Masters degrees, and 5.4% of Doctorate degrees in the fields of science and engineering.[31]

Women have made significant strides in closing the representation gap in many STEM fields but remain significantly underrepresented in others.

> In 2004, women earned 58 percent of all bachelor's degrees, 78 percent of bachelor's degrees in psychology, 62 percent in biological sciences, 51 percent in chemistry, 46 percent in mathematics, 25 percent in computer sciences, 22 percent in physics, and 21 percent in engineering. In general, women earn substantial proportions of the bachelor's degrees in math and the sciences, *except* in computer sciences, physics, and engineering.[32]

The root of underrepresentation in careers in physical sciences, physics, and certain other STEM fields seems to start after elementary school, when girls consistently demonstrate less confidence in their science and math abilities than boys and show less interest in science and math careers from early adolescence. Improving this self-image could make a major difference since girls who do show confidence and interest are more likely to choose STEM majors or careers.[33]

"The Girl Solution, A Gender Equity Toolkit" produced by The Girls, Math and Science Partnership suggests nine techniques for sparking girls' interest and raising their confidence in science and math which are well aligned with the design of the program.[34]

Pittsburgh Science and Technology (PST)

Pittsburgh Science and Technology's meets the city and regional need for a STEM focused program and directly addresses the challenges facing urban schools. Its four core innovations make it possible for the school to succeed for groups of students entering the school at different academic levels. Students entering the school below grade level move through a "continuum of interconnected support systems." Students who enter the school at or above grade level are able to move at an accelerated pace through the same project-based curriculum. All students focus their studies in Science, Technology, Engineering, and Mathematics (STEM). The curriculum follows a three-part progression, first inspiring students to **Dream**, second building **Discovery** skills, and finally applying knowledge and skills through **Design** experiences.[35]

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[30] National Science Board, *Science and Engineering Indicators 2006, Volume 1*, pp. 3.18 - 3-22.
[31] Ibid. *Volume 2*, , Appendix Tables 2-27, 2-29, and 2-31.
[32] Halpern, D. F., J. Aronson, et al. (2007). Encouraging Girls in Math and Science. U. S. D. o. Education. Washington D.C., National Center for Education Research, Institute of Education Sciences**:** 55.
[33] Ibid.
[34] (2007). the girl solution. Pittsburgh, PA, Girls, Math & Science Partnership
[35] These stages of learning are based on those developed by Alfred North Whitehead in his essay titled *Rhythms of Education*.

Anonymity is eliminated at PST as students develop and follow their own academic program. Time is used intelligently; to support quality instruction, sustain morale, and encourage professional growth. Traditional tracking is eliminated through a combination of academic concentrations and levels that provide an alternative to the traditional age-graded structure.

The school is a necessary step for the students and families of Pittsburgh, and a logical one for the city as it strives to solidify its post-industrial niche. We believe that the school will have a positive impact on the Pittsburgh community on at least four levels:

- **For its students:** First, and most directly, PST will benefit its students. They will get a 21st century education focused in one of four fields of science and technology. It will be an education characterized by depth and inquiry, integrating the practical and career-oriented with the intellectual and purely scientific. The curriculum is focused and substantive, teaching the thinking skills necessary for the acquisition and application of knowledge. The school expects to connect most students to higher education, but a career opportunity in a growth sector of the regional economy is also a realistic possibility for PST graduates.

- **For Parents and Families:** Focus groups, surveys, and demographic trends demonstrate that parents and families from across the racial and socioeconomic spectrum desire additional school choices, particularly choices that are designed to provide a supportive and personalized environment for their child that is aligned with their academic interests.

- **For Pittsburgh Public Schools:** Rather than becoming an island of high scientific achievement, PST seeks to examine, develop, and implement new systems and methods that might be "scaled up" and implemented throughout PPS if they demonstrate significant results. PST does not intend to serve only Pittsburgh's elite students. It is carefully designed to serve students at different academic levels.

- **For the city of Pittsburgh:** Despite the diversification of the regional economy, there is a population of Pittsburghers that remains detached from the labor market. In addition, many Americans view Pittsburgh as a 20th century city, one that has passed its prime. PST will be an important response to both of these problems. It will be a step towards connecting city residents to the global economy and a sign to the rest of the country that Pittsburgh will remain an innovative economic leader in the 21st century.

Appendix B: Growth Projections

	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
Grade Levels	None	6th – 9th	6th – 10th	6-11th	6-12th	6-12th
Students	0	250	350	450	550	550
Teachers	0	16	24	32.5	33.5	33.5
	None	• 5 Science • 4 Math • 3 English • 2 History • 1.5 PE/Health • .5 Art	• 9 Science • 5 Math • 3 English • 3 History • 2 ForLang • 1.5 PE/Health • .5 Art	• 12 Science • 7 Math • 5 English • 3 History • 2 ForLang • 1 Art Tech • 1 Music Tech • 1.5 PE/Health	• 12 Science • 8 Math • 5 English • 3 History • 2 ForLang • 1 Art Tech • 1 Music Tech • 1.5 PE/Health	• 12 Science • 8 Math • 5 English • 3 History • 2 ForLang • 1 Art Tech • 1 Music Tech • 1.5 PE/Health
Admin, Counseling, Support Staff	1	6	6.5	7.5	8	8
	Principal	Principal Librarian (.5) Com. Relations Counselor (.5) TechCoordinator Secretary Data Specialist	Principal Librarian Com. Relations Counselor (.5) TechCoordinator Secretary Data Specialist	Principal Dir of Students Librarian Com. Relations Counselor (.5) TechCoordinator Secretary Data Specialist	Principal Dir of Students Librarian Com. Relations Counselor TechCoordinator Secretary Data Specialist	Principal Dir of Students Librarian Com. Relations Counselor TechCoordinator Secretary Data Specialist
New to PPS Courses Offered	0	8	6	10	7	0
	None	Great Problems in Bio, Chem, Physics AfAm Literature Career Prep Career Tech Novice Research Research Methods A A/V Technology Science Forum	E &E – Yr. 1 B&B – Yr. 1 C &C – Yr. 1 F&F– Yr. 1 Research Methods B AfAm History	B&B Elective C&C Elective E&E Elective F&F Elective PostPrep I B&B Yr. 2 C&C Yr. 2 E&E Yr. 2 F&F Yr. 2 AfAm Literature (High School)	PostPrep II Adv. Research Methods Exec. Experience Advanced E&E Advanced B&B Advanced C&C Advanced F&F	None
Total # of Courses Offered	0	28	45	66	79	81

Appendix C – Concentration Sequences

PST High School Science Curriculum

Entry → **Graduation**

	Associate	**Manager**		**Mgr./Exec.**	**Executive**		
	Science Forum (all years) *(0.25 credits per year)* (focuses on integrated science and includes core science standards not covered in Great Problems)						
Body and Behavior (Life Sciences) *Life and the actions of bodies and organisms*	**Great Problems in Biology, Chemistry, & Physics**	**B&B Year One Units:** (1) Biotechnology (2) Great Problems in B&B (3) Organism Interactions (4) Regeneration Science	**B&B Year Two, Semester One Units:** (1) Infectious Diseases (2) Cellular Communications	**Sci-Tech Elective Semesters** (choose at least one): (A) Risk Assessment (B) Horizontal Structures (C) Chemical Analysis (D) Artificial Intelligence	**B&B Advanced Science Semester:** Genomics	**Advanced Research & Design Methods**	**Executive Experience: Two Research Project Semesters**
Computers and Connections (Computer Sciences) *Computation and the social and scientific study of networks*		**C&C Year One Units:** (1) Programming Games (2) Great Problems in C&C (3) Arts Applications (4) Computational Science	**C&C Year Two, Semester One Units:** (1) Mathematics Design (2) Societal Systems		**C&C Advanced Science Semester:** Advanced Programming		
Environment and Energy (Environmental Sciences) *Environment and the social and scientific study of energy*		**E&E Year One Units:** (1) Ecology (2) Great Problems in E&E (3) Atmosphere (4) Energy Systems	**E&E Year Two, Semester One Units:** (1) Material Cycles (2) The Built Environment		**E&E Advanced Science Semester:** Environmental Consulting		
Form and Function (Engineering Sciences) *Engineering, modern manufacturing, and design*		**F&F Year One Units:** (1) Computer Aided Design (2) Great Problems in F&F (3) Controlled Power (4) Material Structure	**F&F Year Two, Semester One Units:** (1) Prototyping (2) Electrical Design		**F&F Advanced Science Semester:** Design Consulting		
Credits	*2 credits*	*2 credits*	*1 credit*	*1 credit each*	*1 credit*	*1 credit*	*2 credits*

Appendix D – Course List

Course Number	Course Title	Subject	Length	Level	Year First Taught
100-01-1	Novice Mathematics (6th grade)	Math	Yr	NV	2009-10
100-02-1	Apprentice Mathematics One (7th grade)	Math	Yr	AP	2009-10
100-03-1	Apprentice Mathematics Two (8th grade)	Math	Yr	AP	2009-10
100-05-1	Specialized Mathematics	Math	Yr	AS	2009-10
100-06-2	Geometry	Math	Sem	AS, MG	2010-11
100-06-2	Geometry	Math	Yr	MG	2010-11
100-07-1	Algebra II	Math	Sem	AS, MG	2010-11
100-08-2	Algebra II	Math	Yr	MG	2011-12
100-09-1	Pre-Calculus	Math	Yr	MG	2012-13
100-10-2	Pre-Calculus	Math	Sem	MG	2012-13
100-12-2	Calculus	Math	Sem	MG, EX	2011-12
100-13-1	AP Calculus	Math	Yr	MG, EX	2011-12
110-01-1	Novice Science (6th grade)	Integrated Science and Tech	Yr	NV	2009-10
110-02-1	Apprentice 1 Science (7th grade)	Integrated Science and Tech	Yr	AP	2009-10
110-03-1	Apprentice 2 Science (8th grade)	Integrated Science and Tech	Yr	AP	2009-10
110-04-1	Great Problems in Physics, Chemistry, & Biology	Integrated Science and Tech	Yr	AS	2009-10
110-05-1	Science Forum	Integrated Science and Tech	Yr	ALL	2009-10
110-13-4	B&B - ScienceTech Elective	Integrated Science and Tech	Mini	MG, EX	2011-12
110-14-4	C&C - ScienceTech Elective	Integrated Science and Tech	Mini	MG, EX	2011-12
110-15-4	E&E - ScienceTech Elective	Integrated Science and Tech	Mini	MG, EX	2011-12
110-16-4	F&F - ScienceTech Elective	Integrated Science and Tech	Mini	MG, EX	2011-12
120-01-1	Spanish I	Foreign Language	Yr	MG, EX	2010-11
120-02-1	Spanish II	Foreign Language	Yr	MG, EX	2010-11
120-03-1	Spanish III	Foreign Language	Yr	MG, EX	2011-12
120-04-1	Spanish IV	Foreign Language	Yr	MG, EX	2011-12
130-01-2	Novice English (6th grade)	English	Sem	NV	2009-10
130-02-2	Apprentice 1 English (7th grade)	English	Sem	AP	2009-10
130-03-2	Apprentice 2 English (8th grade)	English	Sem	AP	2009-10
130-04-2	English 1 & 2	English	Yr	AS	2009-10
130-05-2	English III	English	Sem	MG	2010-11
130-06-2	English IV / AP English	English	Sem	MG	2010-11

130-07-4	English Elective - African American Literature (temporary for 2009-10 only)	English	Mini	AP	2009-10
130-08-4	English Elective - African American Literature	English	Mini	MG, EX	2011-12
140-01-2	Novice History (6th grade)	History/Social Studies	Sem	NV	2009-10
140-02-2	Apprentice 1 History (7th grade)	History/Social Studies	Sem	AP	2009-10
140-03-2	Apprentice 2 History (8th grade)	History/Social Studies	Sem	AP	2009-10
140-04-2	Civics	History/Social Studies	Sem	AS	2009-10
140-05-2	World History	History/Social Studies	Sem	MG	2010-11
140-06-2	American History	History/Social Studies	Sem	MG	2010-11
140-07-4	History Elective - African American History through Literature (temporary for 2010-11 only)	History/Social Studies	Mini	AP	2010-11
160-01-4	Novice Art Technology	Art	Mini	NV	2011-12
160-02-4	Apprentice 1 Art Technology	Art	Mini	AP	2012-13
160-03-4	Apprentice 2 Art Technology	Art	Mini	AP	2013-14
160-04-4	Novice Music Technology	Art	Mini	NV	2011-12
160-05-4	Apprentice 1 Music Technology	Art	Mini	AP	2012-13
160-06-5	Apprentice 2 Music Technology	Art	Mini	AP	2013-14
160-07-4	Art Technology	Art	Mini	MG, EX	2011-12
160-08-4	Multimedia	Art	Mini	MG, EX	2012-13
160-09-4	Music Technology	Art	Mini	MG, EX	2011-12
160-10-4	Music Video Production	Art	Mini	MG, EX	2012-13
160-11-4	Audio/Visual Technology (temporary for 2009-11 only)	Technology / Art	Mini	AP, MG, EX	2009-10
160-12-4	Audio/Visual Technology	Technology / Art	Mini	MG, EX	2011-12
170-01-4	Novice Phys-Ed (6th grade)	Phys. Ed	Mini	NV	2009-10
170-02-4	Apprentice 1 Phys-Ed (7th grade)	Phys. Ed	Mini	NV, AP	2009-10
170-03-4	Apprentice 2 Phys-Ed (8th grade)	Phys. Ed	Mini	NV, AP	2009-10
170-04-4	Health	Phys. Ed	Mini	AS	2009-10
170-05-2	Physical Education A	Phys. Ed	Mini	MG, EX	2010-11
170-06-2	Physical Education B	Phys. Ed	Mini	MG, EX	2010-11
170-07-2	Physical Education C	Phys. Ed	Mini	MG, EX	2011-12
180-01-1	Keystone	Postsecondary Prep.	Yr	ALL	2009-10
180-02-4	Career Prep	Postsecondary Prep.	Mini	NV	2009-10
180-03-4	Career Tech	Postsecondary Prep.	Mini	AS	2009-10
180-04-2	Postsecondary Prep I	Postsecondary Prep.	Sem	MG	2011-12
180-05-4	Postsecondary Prep II	Postsecondary Prep.	Mini	EX	2012-13
200-01-4	Novice Research (temporary class)	Applied	Mini	NV	2009-10
200-02-4	Research Methods A	Applied	Mini	AP	2009-10
200-03-4	Research Methods B	Applied	Mini	AP	2010-11
200-09-4	Advanced Research Methods	Applied	Mini	EX	2012-13

200-10-4	Executive Experience	Applied	Year	EX	2012-13
210-01-4	Environment and Energy - Year One	Environment and Energy	Year	MG	2010-11
210-05-4	Environment and Energy - Fall Year Two	Environment and Energy	Sem	MG	2011-12
210-07-2	Environment and Energy Advanced Science	Environment and Energy	Sem	EX	2012-13
220-01-4	Body and Behavior - Year One	Body and Behavior	Year	MG	2010-11
220-05-4	Body and Behavior - Fall, Year Two	Body and Behavior	Sem	MG	2011-12
220-07-2	Body and Behavior Advanced Science	Body and Behavior	Sem	EX	2012-13
230-01-4	Computers and Connections - Year One	Computers and Connections	Year	MG	2010-11
230-05-4	Computers and Connections - Fall, Year Two	Computers and Connections	Sem	MG	2011-12
230-08-2	Computers and Connections Advanced Science	Computers and Connections	Sem	EX	2012-13
240-01-4	Form and Function - Year One	Form and Function	Year	MG	2010-11
240-05-4	Form and Function - Fall, Year Two	Form and Function	Sem	MG	2011-12
240-07-2	Form and Function Advanced Science	Form and Function	Sem	EX	2012-13

Appendix E: Special Education and Meeting Gifted IEPs

The PST program is designed to personalize the program to meet the needs of each student. Together, several components of the program ensure that each student receives adequate support and/or enrichment. Students with IEPs or Gifted IEPs will find that these systems meet their individualized education plans effectively in the least restrictive environment.

The Advisory Program

It is standard practice that each student develops an individualized program regardless of whether they come to the school with an IEP. Each teacher serves as an advisor to a group of approximately 10 students. They follow this group of students from the beginning to the end of their PST experience and meet with them each Wednesday during third period. Responsibilities of the Keystone advisor include helping set college and career goals, scheduling courses, deciding how to best use third period, and designing three, four, or five year programs. The advisor also serves as a point of contact for families of their advisees.

The PST Schedule

Courses are offered in three different lengths to maximize student choice and scheduling flexibility and to increase time for professional development. **Math courses serve as the anchor for promotion through the five-level system.** Each math course is offered in semester and yearlong versions in the 80-minute block schedule. Thus, students who require additional time or support may take a yearlong math course with a significant amount of time built in for support and individualized intervention.

Personalized System for Promotion

An innovative organizational structure is required since PST seeks to challenge students who are already well prepared academically, while also changing the academic trajectory of those who enter the school working below grade level. Thus, the organizational structure of PST looks very different than that of a traditional secondary institution.

Instead of moving through seven traditional grade levels (sixth-twelfth grade) students progress through five levels. **In this system students are able to complete the ninth-twelfth grades in three, four, or five years.**

The purpose of this alternative structure is to provide the opportunity for students at the high school level to either accelerate their program or, alternatively, to opt for an extra year of high school in order to prepare for the advanced courses, obtain the honors diploma, and graduate with skills that are aligned with the expectations of 21st century universities and employers.

Third Period Support and Enrichment

Period 3 is a school-wide support, enrichment, and activity period. This 99-minute period includes two 33-minute lunch shifts and two 66-minute activity periods. It is surrounded by four 80-minute academic blocks. The activity period is organized by mini, making it possible for all students to participate in four different activities during each academic year. Opportunities respond to the individual needs of students and also to provide teachers the opportunity to be creative and have fun in a non-credit bearing period within the school day.

Students with IEPs, or who need additional support will have the opportunity for individualized support during this period while gifted students will have the opportunity to pursue high-level individual research.

High Level Independent Research for Students with GIEPs

Students with gifted IEPs have the opportunity to participate in independent research during the third period enrichment and support period. A unique section of research, only available to students with GIEPs allows these students to complete extended research projects with the possibility of competing in regional and national science competitions.

Advanced Coursework and the Honors Diploma

Like many prestigious STEM focused public schools including Thomas Jefferson High School for Science and Technology in Alexandria, VA and Baltimore Polytechnic Institute in Baltimore, MD, Pittsburgh Science and Technology plans to offer a unique diploma, with course and credit requirements that go beyond those required to graduate from other schools in the same district. The opportunity to earn this honors diploma, and the commitment to earning it which is made by students and their families when they enter the program, establishes a set of expectations that are uniformly high and aligned with those of universities and 21st century employers.

In order to earn the Pittsburgh Science and Technology Honors Diploma students must complete four advanced courses. They are: (1) Advanced Research Methods, (2) an Advanced Science, (3) an Applied Research course called the “Executive Experience”, and (4) and an Advanced Postsecondary Prep course called “Postsecondary Preparation II”.

Conclusion

Due to this highly personalized program and the standard individualization of education through the advisory program and implementation of IEPs this proposed program is equipped to meet the needs of both GIEPs and IEps. Through skills grouping, the standard practice of differentiation through the utilization of software such as Accelerated Math, and the systems outlined above, IEPs will be met. The full program is taught at an Honors level and there is little doubt that students will be challenged during their pursuit of this unique diploma.

Prepared for Pittsburgh Public Schools,
Mark Roosevelt, Superintendent

This document draws directly from a report originally written by the Systems Synthesis Team advised by Dr. Michael Johnson and Dr. Gordon Lewis published in December, 2006 at the H. John Heinz III School of Public Policy and Management, Carnegie Mellon University. It was further developed during an independent study advised by Dr. Michael Johnson, completed in May, 2007 and then by Pittsburgh Public Schools with the guidance of the Judy Hallinen, Michele Cheyne, Derrick Lopez, Necia Hobbes, the Curriculum Development Advisory Committee and the Pittsburgh Science and Technology Steering Committee.

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