# 21ST CENTURY STEM ACADEMY (21C)
# PEDAGOGY & CURRICULUM

## Dear Potential 21C Parent

Thank you for taking the time to read this introduction to our school's educational philosophy and program. No school or educational program can be perfect for every student and we know that you are seeking the very best match for your child therefore we have tried to provide sufficient information for you to decide whether our program is well suited to your child.

If you enroll your student at 21C, this collegial sharing of information will continue with real-time online access to your child's academic program and outcomes. In addition to accessing information, you will be invited to play an active role in planning, supporting and participating in your child's education including the ability to select additional materials to supplement the resources in your child's digital playlist.

The 21C program prepares students to succeed in the 21st Century global economy by providing *"Deeper Learning by Design*", ensuring that students master core academic curriculum, including interdisciplinary STEM skills, think critically and can solve complex problems, work collaboratively and communicate effectively and are self-directed, confident and are open to and able to incorporate feedback.

Our program is both individualized and personalized. This means that we find out where each child is in their personal learning process and advance them from that point, at their own speed, and we adapt the materials and pedagogy used to meet their interests and learning style. This approach allows us to support students that need acceleration, enrichment or remediation, or indeed, a student that may need a combination of each in different subject areas.

As a general rule, you may assume that the younger the student, the more time will be spent each day in teacher-led instruction and the less time in independent project based learning. Preparation for independent work will however vary from student to student and the earlier a student starts school at 21C the faster they will be prepared to assume significant responsibility for their own education.

## Philosophy of Education

The 21C model incorporates the following design principles:

- Micro-Schools of 40-160 students
- Parent-School partnerships
- Teacher-led and student-centered
- High expectations with self-pacing and mastery based credit
- Deeper Learning

- Extensive blended learning resources
- One-to-one take home Chromebook technology
- Lego STEM curriculum supplemented by STEM focused project based learning
- The ability for teachers to create personal resource "playlists" for each student
- Progressive transfer of shared responsibility from teachers to students

Parents are the primary educators of their child and by enrolling a student at a 21C school, parents are selecting an educational experience that is both personalized and individualized while also choosing to prioritize their child's unique needs and personal education and development over the "big school experience".

Unlike a "big school", every teacher at 21C knows every student and we are able to provide a level of personalized support and opportunity that is unthinkable in an industrial-scale institution.

As we talk about our school in this document we will briefly address areas of our program with which parents are likely to be most familiar and provide greater detail and even academic references for areas of the program that are probably very different to a parent's own school experience. This is not to deemphasize critically important disciplines such as literacy and core Math skills but merely to keep the document to a manageable size!

The curriculum is personalized, meaning that the content is customized to the interests and learning style of the individual student. The curriculum is also individualized, meaning that different students will start at different points and move at their own speed.

As educators and parents, we know that every child wants to learn and that every child has the capacity to learn. We also realize that children develop at different paces and sometimes experience academic development in different sequences to other students, and we know that is absolutely natural and should be embraced.

At 21C each student is provided with learning opportunities appropriate to their individual development and we very deliberately identify and celebrate their gifts, building their confidence to progress and take on those challenges that they are ready to face and conquer.

We measure our school's success not by "average" test-scores but by the documented progress that is achieved by each individual student. Unless <u>every</u> student finds success we have not achieved our objective as educators which is to create an environment that encourages every student to maximize their potential.

Motivating students and personalizing learning is necessary to improve student achievement. This is bound to enlarge and to change the teacher's role.[1] We believe teachers know the students best, and should be free to adapt and innovate according to their students' needs. This runs against much current thinking about standards and accountability, which wants to script and restrict what teachers do, narrowing professional discretion, an approach which discourages teachers, making it hard to attract and retain talent.

[1] "Education|Evolving." *Home*. Web. 30 Apr. 2015. <http://www.educationevolving.org/>.

## Character and Life Skills

Our teachers will be privileged to spend a great amount of time with your child during the years that will help to form their character and build the foundation for their adult lives. During those years our school will seek to provide an environment that protects your child from many of the most destructive influences of our society and allow you as their parent to decide the appropriate time to expose them to the existence of ideas and behaviors that are inconsistent with your value-sets.

Our goal is that all students will have a strong sense of themselves as 'moral agents' in society, with clear ideas about what matters, a sense of their own growth and change over time and their own unique identity and responsibility.

While 21C is a secular school, if a student comes from a faith background, we will seek to reinforce their formation by modelling and imparting inherent, universal core moral standards:

- Trustworthiness
- Kindness
- Care
- Love
- Honesty
- Truthfulness
- Fairness
- Respect
- Being positive
- Self respect
- Responsibility

As we consider the characteristics of a 21C graduate, we would apply the following descriptors:

- Hardworking
- Responsible
- Confident
- Innovative
- Keeping deadlines
- Punctual
- Resolute
- Resourceful
- An independent-learner
- Organized
- Respectful
- Willing to learn
- Honest
- Polite
- Friendly
- Loyal
- Tolerant
- Open-minded
- Balances work / family life
- True to their faith

21C graduates will enter high school as confident, self-directed learners able to function comfortably and successfully with a variety of teachers, pedagogies and peers.

The environment at 21C schools will be carefully monitored to create a culture of inclusion but it is unrealistic to assume that there will be no incidents of unkindness or even bullying from time to time. To take a proactive stand on this issue, we will be operating a Chapter of the *Ambassadors 4 Kids Club*, an anti-bullying program designed to foster an environment of respect, kindness, and human decency within the school.

## Curriculum

There are traditional subject divisions and a full & broad academic curriculum at 21C. Primary content delivery is a combination of direct instruction and blended learning. 21C students are fully prepared for success in standardized tests but that is only a part of the story.

At a time when many schools are not able to provide students with an educational program that is able to maintain them on grade level you may wonder how we can provide a rich academic program that allows for acceleration and still incorporate hands-on activities at an unprecedented level. Quite simply, we are able to combine a full and rigorous academic curriculum with project-based learning both because our blended learning pedagogy frees up significant teacher time for one-on-one and small group activities and we also have a longer school day and longer school year.

21C provides students with an adaptive curriculum that allows them to pursue their passions and interests, maximizes the realization of their individual talents and prepares them for success in the technology and information driven 21st Century Economy. Our curriculum implementation incorporates the following design principles:

- Combination of direct instruction with blended & project based learning
- Personalized playlists
- High expectations
- Self-pacing
- Mastery based credit
- Deeper Learning
- One-to-one Chromebooks
- Project-based STEM including computer coding

All of that said, the curriculum is just a starting point as every student has their own personalized playlist of learning resources that are selected to meet their specific learning style, interests and development level. The playlist is managed by the teachers working in partnership with the student, but additional resources can be added to it by the student or by the student's parent. Additional resources accessible via the playlist include a digital library of 20,000+ age appropriate books, 12,000+ educational videos, 38,000+ images and 180 3D models allowing for hundreds of 3D and Virtual Reality visualizations.

## Blended Learning Curriculum

The blended learning curriculum is used via one-to one Google Chromebooks and can be accessed at school, home or anywhere else with an Internet connection. The blended learning curriculum can be used by a teacher in class, by students in groups with or without adult facilitators or independently. Independent use of the curriculum is not typical before 3rd Grade but the program can be used at home with parent or other adult facilitation.

The blended learning curriculum that we are using is proprietary and has been developed over the last 12 years. The curriculum has been successfully used by tens of thousands of students and

is research-based incorporating proven best practices. We are constantly developing our curriculum and we frequently supplement it with best-in-class resources from leading publishers and academic institutions.

Our blended learning curriculum is mastery based meaning that it provides a cumulative review to ensure mastery by incorporating several levels of assessing the students' knowledge and mastery level. The curriculum also uses sequential learning and spaced repetition techniques to ensure retention of information in each lesson.

First, students take a pre-test, to identify their baseline or current mastery level of course standards. Based upon results of the pre-test, an Individualized Learning Plan (ILP) is generated, which lists all the skills the student will be working on in the course. Specific course lessons/topics, are assigned to the student and the teacher may choose to provide additional resources through the student's playlist. The additional resources may be used to provide alternative explanations of the concepts to be covered, additional challenge questions or enrichment materials that increase the academic challenge or frame the materials in a way better suited to the student's learning style or more directly relevant to the students interests.

While the pre-test can be set to eliminate lessons that students have already mastered, teachers may use it for baseline scoring purposes only and assign all the lessons in the course to the student.

Students will typically work independently on the assigned lessons and receive formative questions embedded in the lesson that are designed to check their ability in retaining certain key concepts or, if remediation of content up to that point is needed. If additional assistance is needed, the student may, at any time during their lessons, request assistance from a teacher. The teacher will present alternative methods of instructional content delivery that can facilitate a deeper understanding of the concepts presented in the lesson.

At the end of each lesson the student will answer embedded post-lesson assessments. Typically, seven questions are included consisting of five multiple-choice and two constructive response questions, however the number of questions can be defined by the teacher. If the teacher defined mastery percent has not been achieved, the lesson can be "reset." and the student can review the materials independently or seek help from a peer or a teacher. A teacher may provide direct assistance or provide additional learning resources in the student's playlist. Once the student feels prepared they may again take the end of lesson assessment with new set of questions.

After a student completes all of their lessons with a mastery score the student is given a post-test. The post-test is a comprehensive assessment of the course content so that if a student was pre-tested and some lessons were eliminated based on mastery of those pre-test questions, they will be double checked through the post-test assessment.

If the student does not pass the post-test the teacher may review the data captured by the assessment and identify the specific areas/standards the student did not do well on and target them by reassigning appropriate lessons to the student or providing additional materials in the student's playlist. This allows the student to remediate and prepare once again for the post-test. If they remediate successfully in the lessons the post-test will be re-assigned and the student will be presented with different assessment questions.

## Literacy

The ability to read at a reasonable pace with a high level of comprehension, and write clearly (and preferably eloquently) contributes substantially to a student's prospects for success in school, college and adult life but our definition of functional Literacy goes further and we believe that "literate" students must be able to:

- Communicate effectively with others
- Think and respond critically in a variety of settings to a myriad of print and non-print text
- Access, use, and produce multiple forms of media, information, and knowledge in all content areas

Literacy is critical to success in every subject area taught at 21C and strategies include:

- Phonemic Awareness Instruction**:** We utilize multi-modality activities to build student awareness for phonemes. Students learn to isolate, identify and categorize phonemes using the letters of the alphabet before moving on to blending, segmentation and phoneme deletion, addition and substitution.

- Phonics Instruction: We use systematic and explicit instruction in teaching alphabetic knowledge and reading, and incorporate research-based instructional approaches including analogy-based, synthetic, and phonics-through-spelling instruction.

- Fluency**:** Our program includes repeated oral reading of texts with feedback. Students follow along as texts are read by fluent readers. One-on-one reading and structured practice build fluency and increases reading independence.

- Vocabulary: We use explicit instruction to teach individual words and word-learning strategies. We teach students to learn to recognize and derive meaning from word parts and use context clues.

- Text Comprehension**:** Strategies include monitoring comprehension, recognizing story structure and summarizing what has been read. We use modeling and guided practice while pairing fiction and non-fiction texts of similar genres.

Due to its unparalleled importance, literacy is addressed for as great a part of the day as it is needed to ensure that each student progresses at the pace that is appropriate for them and it is interwoven throughout the curriculum not just in Language Arts classes.

In addition, reading for pleasure is an incredibly valuable habit and all 21C students will have group or individual reading time built into their schedule. Students will be able to use their school supplied computing device as an e-reader and will have access to an extensive library of age appropriate books and publications. [2]

[2] *Reading for pleasure: A research overview*, Christina Clark and Kate Rumbold, National Literacy Trust, November 2006

## Math

Within the "big ideas" that provide the framework for the curriculum, our approach to Mathematics identifies central themes, or topics, as the basic structure of mathematics. These topics are sequenced from basic skills to more advanced complex skills. High-quality instruction cannot occur without a solid foundation in content and the "big ideas" of mathematical content are systematically incorporated into and assessed within the curriculum as categorized into five areas by NCTM (1989, 2000) and NAEP[3]:

- Numbers and operations
- Algebra
- Geometry
- Measurement
- Data analysis and probability

But in addition, our Math program focuses on key aspects of Mathematics learning that research has demonstrated as critical to the success of Singapore's Math program which is consistently ranked as # 1 in the World:

- Estimation
- Mental calculation
- Arithmetic
- Algebraic manipulation, and handling of data
- Numerical, geometrical, algebraic, and statistical concepts;
- Processes, or thinking skills
- Metacognition, the monitoring of one's own thinking
- Attitudes regarding mathematics, including interest, confidence, and perseverance

Our spiraled curriculum presents skills and ideas first in a form and language that can be grasped by the student, and then revisits them in greater depth at subsequent grade levels. When a curriculum is organized in a spiraled manner, the student continually builds upon what he or she has already learned[4]. An effective curriculum organizes and integrates mathematical ideas so students understand how ideas connect to, and build on, other ideas. These connections provide natural opportunities for spiral presentation as well as for scaffolding of learning activities[5]

In accordance with the school's commitment to PBL and Deeper Learning, Math learning will not be restricted to the traditional classroom and teachers will be encouraged to utilize cross-curricula projects to teach and reinforce Mathematical theories including the creation of artifacts of learning through applications such as computer aided design and 3D printing of student-engineered constructs.

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[3] Perie, M., Grigg, W., and Dion, G. The Nation's Report Card: Mathematics 2005 (NCES 2006– 453). U.S. De21Crtment of Education, National Center for Education Statistics. Washington, D.C.: U.S. Government Printing Office, 2005.

[4] Kearsley, Greg. "Explorations in Learning and Instruction: the Theory-into-Practice Database," 2003

[5] Vygotsky, Lev. "Interaction Between Learning and Development." Mind in Society. Trans. M. Cole. Cambridge, MA: Harvard University Press, 1978.

## Natural Sciences

Our Natural Sciences program blurs the boundaries between Biology, Physics and Chemistry in a combination inspired by the world renowned Cambridge University undergraduate program and is foundational to our broadly based STEM program.

The program is concerned with the description, prediction and understanding of natural phenomena based on observational and empirical evidence.

Each of these disciplines is brought to life through hands-on experiences in the STEM Lab but those experiences are expanded by the use of Virtual Reality to conduct and observe experiments that are not feasible (or sometimes safe) for a school science laboratory.

Science is of course a perfect opportunity for the implementation of PBL and teachers will make extensive interdisciplinary use of the school's STEM Lab to allow students to bring scientific theories into real world applications in parallel to imparting the disciplines of the Scientific Method whether by designing, printing and testing 3D engineering components or managing and observing the symbiosis occurring within the schools agroponic tanks.

## Social Studies

The primary goal of social studies education is to equip young people to develop the ability to make informed and reasoned decisions as citizens of a culturally diverse, democratic society in an increasingly interdependent world. Within our school program we draw upon such disciplines as anthropology, archaeology, economics, geography, history, law, philosophy, political science, psychology, religion, and sociology, as well as appropriate content from the humanities, mathematics, and natural sciences.

We also connect social science with our project based study of STEM and pursue school wide projects to seek scientific solutions to the great global challenges facing mankind such as food and water shortages, energy production and pollution. In many projects students will work with students at sister-schools in other parts of the United States and even worldwide to learn about life in different communities, share data and combine talents in pursuit of innovative outcomes.

## STEM focused Project Based Learning

Project Based Learning[6] is a teaching method in which students gain knowledge and skills by working for an extended period of time to investigate and respond to a complex question, problem, or challenge. Popular in pre-professional training in medicine, science, technology, engineering and mathematics careers since the 1970's, momentum has more recently developed

[6] "Why Project Based Learning (PBL)?" *Project Based Learning*. Web. 30 Apr. 2015. <http://bie.org/>.

to extend these practices to elementary and secondary classrooms.[7] Essential Elements of PBL include:

- Significant Content – At its core, the project is focused on teaching students important knowledge and skills, derived from standards and key concepts at the heart of academic subjects.
- 21st Century Competencies – Students build competencies valuable for today's world, such as problem solving, critical thinking, collaboration, communication, and creativity/innovation, which are explicitly taught and assessed.
- In-Depth Inquiry – Students are engaged in an extended, rigorous process of asking questions, using resources, and developing answers.
- Driving Question – Project work is focused by an open-ended question that students understand and find intriguing, which captures their task or frames their exploration.
- Need to Know – Students see the need to gain knowledge, understand concepts, and apply skills in order to answer the Driving Question and create project products, beginning with an Entry Event that generates interest and curiosity.
- Voice and Choice – Students are allowed to make some choices about the products to be created, how they work, and how they use their time, guided by the teacher and depending on age level and PBL experience.
- Critique and Revision – The project includes processes for students to give and receive feedback on the quality of their work, leading them to make revisions or conduct further inquiry.
- Public Audience – Students present their work to other people, beyond their classmates and teacher.

Project Based Learning will be an important element of the learning experience for every student but the time spent in this activity will vary from student to student based on age, maturity, learning style and their overall academic needs. Given our commitment to the maintenance of direct instruction and blended learning as important elements of the academic program we do not envision students spending an average of more than 30% of their school days engaged in PBL.

Teachers and students, working together, will have significant discretion in designing projects and the educational experiences incorporated in the project process. These may include working with students in other schools and countries, visiting "experts" and field trips.

Although STEM is the focus of our PBL design, teachers and students may incorporate elements from every subject area and PBL projects may address issues raised in any other class.

PBL calls for genuine collaboration. Students learn how to work well as a team. In engineering, a project team might include someone responsible for engineering, someone else focusing on finance, and another team member responsible for regulatory issues. Everyone's got a specialty.

[7] Holm, Margaret. "PROJECT-BASED INSTRUCTION: A Review of the Literature on Effectiveness in Prekindergarten through 12th Grade Classrooms." *RIVIER ACADEMIC JOURNAL* 7.2 (2011). Web. 30 Apr. 2015. <http://www.rivier.edu/journal/ROAJ-Fall-2011/J575-Project-Based-Instruction-Holm.pdf>.

You're expected to bring that expertise to the project and rely on everyone else's expertise.[8] PBL provides a tangible way for students to acquire this skill set.

Several research studies looked at the effects of project-based learning on categories of learners or learner characteristics that are associated with school failure in traditional classroom situations. Teachers reported that the real-world focus of the projects allowed students who did not generally shine in academic discussions to share their knowledge about subject matter that was familiar and accessible. Teachers in this study also reported a reduced need for disciplinary actions during project-based study, citing increased student engagement as the chief reason. Additionally, several studies indicated that the beneficial academic effects of project-based instruction were most pronounced for middle- to low-achieving students.[9]

STEM education is vital to the future of our children, our region and our country. STEM is everywhere; it shapes our everyday experiences.[10] Science is our natural world. Technology has changed our world and the manner in which we interact with other people (i.e. the smartphone). Engineering is focused on the design of systems and problem solving. We only have to look around to see what improvements to our lives and our homes have been engineered in the last decade alone. And Math is everywhere–every other STEM field depends on mathematics. STEM is important, because it permeates every aspect of our lives.

STEM is the present and future. In 2009, the United States Department of Labor listed the ten most wanted employees. Eight of those employees were ones with degrees in the STEM fields: accounting, computer science, electrical engineering, mechanical engineering, information sciences and systems, computer engineering, civil engineering, and economics and finance.

STEM careers are professions that build communities and transform nations. STEM professionals are in charge of solving the complex problems of today's world and its future. They are working to find solutions for global warming, cancer, third world hunger, disappearing habitats, and an interdependent world economy. STEM careers are both challenging and fun.

For our region, investing in the future of science, technology, engineering and mathematics makes sense for long-term economic development. Atlanta will remain an economic hub provided our schools and universities provide a pipeline of talent. Introducing our young children and current students to STEM opportunities and getting them engaged and excited about seeking advanced schooling in these areas is essential to meet the demands of the 21st century marketplace.

For 35 years LEGO has been delivering playful learning experiences that bring subjects to life in the classroom and make learning fun and impactful. Our students will have access to a wide range of physical and digital educational resources that will encourage them to think creatively, reason systematically and release their potential to shape their own future.

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[8] Boss, Suzie. "Emphasize Real Problems to Boost STEM Learning." *Edutopia*. 20 Apr. 2015. Web. 30 Apr. 2015. <http://www.edutopia.org/blog/emphasize-real-problems-boost-stem-learning-suzie-boss>.

[9] Mergendoller, J. R., & Maxwell, N. L. (2006). The effectiveness of problem-based instruction: A Com21Crative study of instructional methods and student characteristics. The Interdisciplinary Journal of Problem-Based Learning, 1(2), 49-69.

[10] Web. 30 Apr. 2015. <https://www.nms.org/Portals/0/Docs/Why Stem Education Matters.pdf>.

LEGO® Education curriculum will be used to compliment our STEM activities and brings together disciplines and skills including Math, Architecture, Design Thinking, Engineering, Coding, Creativity, Innovation and Problem Solving.

In the US, close to 20,000 schools teach different subjects using LEGO Education solutions including curriculum-relevant material and digital resources and we have made an extensive investment in curriculum and materials that span from Kindergarten to High School. With educational sets, lesson plans and curriculum material, assessment tools and teacher training the LEGO programs provide an additional resource to make learning inspiring, engaging and effective as well as providing a structure for competition through the LEGO "*FIRST*" Leagues.

- Through *FIRST* LEGO League Jr (ages 6-9) teams learn about simple machines as they build a model with motorized parts and build their communication skills by creating a "show me" poster. League value include celebrating discovery, teamwork and "Gracious Professionalism".

- FIRST LEGO League is an international inquiry-based program for children ages 9-14 that grows their interest in science and technology through an exciting team-based competitive event that includes a research assignment, a robot game using LEGO MINDSTORMS and life skills projects.

Our school also has a state of the art STEM Lab allowing faculty to incorporate hands-on cross-curricula design and fabrication activities creating a fusion of Science, Technology, Engineering, Math and other 21st-Century skills.

The STEM Lab provides students to access with state of the art electronic equipment including a studio recording deck, an Internet streaming & low-power-FM radio station and even a flight simulator cockpit allowing students to learn to pilot light aircraft and complete FAA ground school as well as the less strenuous experience of flying as a passenger in a Space Shuttle.

Resources in the STEM Lab also include many means of producing artifacts including 3D printing, laser engraving & cutting and metal casting. The STEM Lab will be a place where students can tinker, create, be inspired and get excited about STEM both within and outside the formal school curriculum.

Project Based Learning offers students the opportunity to demonstrate their learning by many different and innovative means including dramatic presentations and other performing arts. Where students manifest a wish to utilize such demonstrations of learning, the school will assist them to obtain the learning resources needed.

## Coding

Although Coding is a part of the overall STEM program (including the LEGO Education programs) 21C sets aside specific time in the schedule for a core coding curriculum including ScratchJr, Code.org and Treehouse Learning.

The Bureau of Labor Statistics predicts that computer science and IT jobs will continue to grow into 2020, but the current and future U.S. workforce may not be prepared:

> "Students need to acquire the 21st century skills necessary to thrive in the modern workforce," "Computing is currently one of the fastest growing occupations in the country with average salaries nearly twice the national rate. In fact, more than half of the projected job growth in the STEM fields will be in computing occupations. We must begin training our young people in these areas prior to their post-secondary education so they are prepared to fill these high-wages, in-demand positions." [11]

Computing is a fundamental part of daily life, commerce, and just about every occupation in our modern economy. It is essential that students be exposed to the field of computer science in our K-12 system—as it is foundational in transforming the way a student thinks about the world. It not only teaches them about technology, it also teaches them how to think differently about any problem.

Computer science puts students on the path toward some of the highest paying, fastest growing jobs in America yet roughly 90 percent of schools do not teach it. A lack of access to Computer Science education hurts our economy and creates major inequities in education, particularly for those groups that have been traditionally underrepresented in computer science and other Science, Technology, Engineering and Mathematics (STEM) fields. [12]

Coding (or computer programming) is a new type of literacy. Just as writing helps students organize their thinking and express their ideas, the same is true for coding. As young children code they learn how to create and express themselves with the computer, not just to interact with it. In the process, children learn to solve problems and design projects, and they develop sequencing skills that are foundational for later academic success. They also use math and language in a meaningful and motivating context, supporting the development of early-childhood numeracy and literacy.

Coding assists with the development of key skills:

- Communication and self-expression: Programming is a non-verbal way to represent thoughts or personality on a screen
- Sequencing and order: Young students focus greatly on patterns and ordering, including learning how to create and discern patterns, telling stories, and even learning to tie their own shoes. This more mathematical or structured way of thinking lends itself nicely to coding, where students can see the immediate effects of changing a sequence or order.
- Problem solving: Kindergarten students are learning as much about social behavior as they do about academics. Coding helps them develop the social skills necessary to collaborate with peers.

Elements of Programming that Support Pre-Readers include the following:

[11] Governor Nathan Deal addressing the Board of Regents of the University System of Georgia. (August 25th, 2014)
[12] Code.org database sourced by a combination of data from the College Board, the Computer Science Teachers Association, and individual teacher submissions: http://code.org/learn/local.

- Sequence
- The concept of code (written language)
- Cause and effect
- Counting
- Planning
- Left-to-right reading
- Problem solving

At 21C, the coding experience for Pre-Readers starts with ScratchJr, an introductory programming language that enables young (Pre-Reading) children (ages 5-7) to create their own interactive stories and games. With ScratchJr, children snap together graphical programming blocks to make characters move, jump, dance, and sing. Children can modify characters in the 21Cint editor, add their own voices and sounds, even insert photos of themselves – then use the programming blocks to make their characters come to life.

ScratchJr was inspired by the popular Scratch programming language http://scratch.mit.edu. The Scratch interface and programming language was redesigned in ScratchJr to make them developmentally appropriate for younger children, carefully designing features to match young children's cognitive, personal, social, and emotional development.

Once an individual student is classified as an Early-Reader they can progress to the Code.org curriculum. Using this curriculum, students can emulate the engineering design process when they focus on their own creation challenges. That process uses the following sequence: ask, imagine, plan, create, test & improve, and share. The process also helps to break down the idea of perfectionism and gives the student an opportunity to safely experiment with his or her own ideas.

By the end of each Code.org course, students can create interactive games or stories that they can share with anyone. The courses are flexible so teachers can tailor them to their class based on their students' developmental level and prior experience. Code.org lessons align to CSTA and ISTE standards and reinforce concepts and skills taught in other subject areas by integrating Math, Language Arts and Science Standards.

Once a student has acquired satisfactory reading skills (as determined by their teachers) and completed the Code.org curriculum they will be enrolled in the Treehouse Learning program which has resources across all major programming languages and can develop a student's skills to a professional coding level.

## Art & Music

For students in Kindergarten, 1st and 2nd Grades, Art and Music are incorporated into their overall class activities. Specific Art and Music classes are scheduled for 3rd through 8th Grade and parents may also schedule optional at-cost after school Art & Music lessons.

Although Art & Music each enjoy their own dedicated time in the schedule they are constituent elements of interdisciplinary activities and valuable tools in teaching Mathematics, Physics and so many other concepts.

At all levels, Art is integrated into PBL as a means of communication, demonstration of concepts and for the rendering of design elements / outputs. Traditional art mediums such as Drawing (including Zentangle), Painting and Sculpture are complimented by or translatable into digital mediums including Web Design, Computer Aided Design, Photography, Videography and 3-D Printing.

Virtually every aspect of our lives is touched by "design" and our society has become more and more design conscious elevating the teaching of Art to a place at the core of any comprehensive contemporary education.

Music classes provide students with valuable opportunities to develop and practice fine motor skills while building and playing traditional musical instruments. Music appreciation classes provides student with a tangible experience of the changes in tastes and fads over time and a unique connection to historic events and as such can also be incorporated in many elements of the curriculum.

Within our PBL program, music can be incorporated into soundtracks for movies and other presentations and may lead students into a potential interest in musical composition, soundtrack editing & studio recording or even management of the school's streaming Internet radio station.

## Chinese (Mandarin)

Students from Kindergarten upwards will learn Mandarin with a combination of traditionally taught classes, blended learning using Rosetta Stone's K-12 programs, and for older students, online tutoring and supervised online conversations and correspondence with students that are native Mandarin speakers. This highly effective methodology offers:

- Carefully sequenced lessons that introduce vocabulary and grammar, building upon previously learned content
- Immediate feedback on every response to key concepts and correct learning
- Speech recognition within all blended learning lessons and activities, which helps improve students' pronunciation and speaking confidence
- Games that encourage students to practice listening and reading skills and build confidence, increase engagement, and develop vocabulary learned in core lessons
- Practice reading long story passages, leveled to student ability, with feedback via speech-recognition technology
- Live conversation sessions that focus on topics aligned with the student's current proficiency level, reinforcing newly acquired skills

## Deeper Learning

*"Imagine that you walk into an eighth-grade classroom. A small group of students is cheering. They've just discovered that the wind turbine they designed and built can produce almost six volts of electricity. One of the students tells you that she had to redesign the blades several times, but that she persevered. Why? She was inspired by a book she read in English class about a man in Malawi who built a wind turbine out of scrap metal to bring electricity to his village.*

*Another student shows you a map she made in social studies class. She points to the areas where wind turbines could be built in her state. And she proudly presents her persuasive essay, which explains the value of wind turbines.*

*These students are engaged in deeper learning—which means they are* using *their knowledge and skills in a way that prepares them for real life. They are mastering core academic content, like reading, writing, math, and science, while learning how to think critically, collaborate, communicate effectively, direct their own learning, and believe in themselves (known as an "academic mindset").*"[13]

When applying Deeper Learning:

- Students build their academic foundation in subjects like reading, writing, math, and science. They understand key principles and procedures, recall facts, use the correct language, and draw on their knowledge to complete new tasks.
- Students think critically, analytically, and creatively. They know how to find, evaluate, and synthesize information to construct arguments. They can design their own solutions to complex problems.
- Collaborative students work well in teams. They communicate and understand multiple points of view and they know how to cooperate to achieve a shared goal.
- Students communicate effectively in writing and in oral presentations. They structure information in meaningful ways, listen to and give feedback, and construct messages for particular audiences.
- Students develop an ability to direct their own learning. They set goals, monitor their own progress, and reflect on their own strengths and areas for improvement. They learn to see setbacks as opportunities for feedback and growth. Students who learn through self-direction are more adaptive than their peers.
- Students with an academic mindset have a strong belief in themselves. They trust their own abilities and believe their hard work will pay off, so they persist to overcome obstacles. They also learn from and support each other. They see the relevance of their schoolwork to the real world and their own future success.

[13] "What Is Deeper Learning?" *Hewlett Foundation News*. Web. 7 February 2016. <http://www.hewlett.org/programs/education/deeper-learning/what-deeper-learning>.

## Assessment

Assessment of student performance will be achieved using formative and summative assessments, as well as various instructional strategies employed by 21C teachers. Teachers will collect baseline data from the NWEA MAP test and MAP for Primary Grades. Teachers will also use specific instructional strategies to activate students' background knowledge, and to help students focus their learning. Teachers will also use a common rubric to assess the skills needed for project-based learning (Inquire, Design, Create, Share) to evaluate content, and creativity. Great care will be taken to ensure that student assessment goes beyond "content compliance" and multiple-choice tests to measure and document the achievements of each student as well as identifying opportunities to support the student in areas of potential growth.

Teachers will also use formative assessments that include publisher and teacher-created assessments, as well as assessments from supplemental material to obtain performance data for each student. Examples of teacher-created formative assessments include but are not limited to:

- Teacher-created content tests
- Multi-year capstone
- Science and Engineering Fair Projects
- Student portfolios
- Journals
- Teacher observations
- Probing questions
- Writing samples that focus on the development of expository, narrative, persuasive, and analytical writing skills
- Anecdotal records of the student's performance
- Attitude inventories

Our blended learning curriculum incorporates assessments that monitor the student's academic progress in real-time and allow for rapid intervention. Students receive grades and report cards that combine both traditional assessment tools and their projects.

Teaching activities are adapted in response to assessment results. When students take a diagnostic assessment, personalized learning paths specific to the students' academic needs are dynamically assigned to each student.

Students also have the opportunity to perform self-assessment. As students complete their individualized learning components, they engage regularly with interactive elements and assessment content that provide the opportunity to gauge their performance against their own goals and expectations. Because the environment is built for their learning needs rather than an entire class, students are more often more involved in the learning process than they would otherwise be.

## Play & Movement

All students will participate in the *Move to Improve* Program. MTI is a classroom-based physical activity program designed by the New York City Department of Education (DOE) and the New York City Department of Health and Mental Hygiene (DOHMH) to increase physical activity among students, K-5, in elementary school.

The MTI program provides 120 minutes of physical activity each week. For students in 6th, 7th and 8th grades, MTI will be complimented by the use of exercise bikes and other on-campus exercise equipment.

For students in Kindergarten, 1st and 2nd Grade, play is an integral part of the day and is regularly incorporated on a flexible basis by the teaching staff.

Weather permitting, students will spend some time outside in the small garden area and the Elementary area of the indoor campus also features equipment that can be used for physical activities including the "monkey gym" and a balance beam and balancing rocks.

For students from 3rd grade upwards, weather permitting, some part of each day will be scheduled in the garden and each student will have a 45-minute recess time with a small peer group.

Parents are encouraged to enroll students in sports activities outside school and the school will sponsor parent-organized recreational teams if there is sufficient interest. Space permitting, parents may arrange appropriate after-school sports activities on-campus (e.g. dancing and karate lessons)